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MARKETING CHANNELS FOR WILD AND CULTIVATED EDIBLE MUSHROOMS IN DEVELOPING COUNTRIES: THE CASE OF MEXICO

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ABSTRACT

Food products require efficient marketing systems to move from producers to consumers keeping high quality and price. In many developing countries, although mushroom production is well established and increasing, the marketing systems are poorly understood. During 1999-2004, we studied the channels of distribution for wild and cultivated mushrooms in central Mexico following an institutional approach (550 interviews). Most wild and cultivated mushrooms are marketed within this region. Representative places were selected for this study: a large city (Mexico), two medium cities (Puebla, Toluca), and a rural community (Cuetzalan). Several marketing channels were identified and described, involving middlemen, wholesalers, retailers, "tianguis", public markets, retail food stores, and food services. The grower's share, the gatherer's share, and the mushroom marketing margin were also estimated. The present mushroom marketing system evolved from a small centralized process to a combination of centralized and decentralized marketing processes involving limited activities. During this series of changes, large private enterprises took over several marketing functions supporting the decentralization process, but discouraging the development of new firms specialized in mushroom marketing and processing. At the same time, changes also led to the market concentration of open-market sales in large private enterprises and functional wholesalers. Main structure, organization and trends of the Mexican mushroom marketing system are discussed.

Key words: Marketing channels, marketing margins, cultivated mushrooms, wild mushrooms, Mexico, developing countries.

INTRODUCTION

The importance and complexity of food marketing systems is normally associated to economic and social development. In efficient and balanced marketing systems, consumers get the highest food value at the lowest possible price, farmers obtain the highest possible returns from food sales, and the market agents earn the greatest profit possible[4]. The recent rapid expansion of the international trade has also increased the importance of more efficient transportation and handling. In modern markets, marketing firms are directly involved not only in these activities, but also in the overall food economy. They perform diverse additional activities, such as financing, collecting, sorting, grading, storing, packaging, processing, canning, branding, and distributing foods to the market. These functions of controlling the flow and quality of foods are performed efficiently due to specialization and economies of scale.

In developing countries, the increase in food production is normally not accompanied by a higher efficiency in the food marketing system. This is the case of edible mushrooms in Mexico, where consumers may get low quality products at high prices despite the great increase of commercial mushroom production (*Agaricus*, *Pleurotus*) during last decades[18, 19, 20, 24].

Wild edible mushrooms have been marketed in Mexico since pre-Columbian times. These mushrooms were gathered, swapped or sold at traditional "tianguis". By contrast, cultivated edible mushrooms from private enterprises were first marketed during the early 1940's. *Agaricus* mushrooms were only sold in the American and French embassies, as well as in some exclusive restaurants from Mexico city. Cultivated *Pleurotus* mushrooms began to be marketed since 1974, following a grower's strategy of selling *Agaricus* mushrooms to wholesalers and retailers, only if they were able to buy *Pleurotus* mushrooms as well. *Lentinula* mushrooms have been cultivated irregularly since 1984, and basically marketed in the gourmet food stores[5, 8]. Basic, applied and socioeconomic research work at the COLPOS, *Campus* Puebla, during 1989-1998, allowed the rural production of edible mushrooms (*Pleurotus*). Small-scale mushroom production is now being carried out in many rural and suburban peasant communities throughout the country. Rural mushroom production is marketed regionally when carried out far from big cities[1, 2, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 22, 23]. At present, about 38,708 tons of edible mushrooms are produced per year, mainly in the temperate plateau from central Mexico at high altitudes (1,500-2,200 m). In general, most commercial production is marketed in central Mexico, and from there to the rest of the country, *i.e.*, northern, southern, eastern, western cities. During 1999-2001, there were also increasing imports ranging from 4,973 to 6,531 tons, while exports varying from 345 to 1,602 tons[6]. Dumping practices represent a new challenge for the domestic market, as they have recently been found by the Mexican mushroom industry in canned mushrooms coming from China and Chile. In general, mushroom consumption in Mexico has developed basically by inertia selling or grower-oriented strategies[19, 20].

In this work, we studied the main marketing channels for wild and cultivated mushrooms in central Mexico, estimating the marketing margins. General structure, organization, and trends in the Mexican mushroom marketing system are discussed, as well as their relevance to other developing countries.

MATERIALS AND METHODS

Region of study. The States of Mexico and Puebla were selected for this study during 1999-2004. Most wild and cultivated mushrooms are marketed within this region. A large city (Mexico: 8.6 millions), two medium cities (Puebla: 1.3 millions; Toluca: 666,596), and a rural community from the State of Puebla (Cuetzalan: 45,010) were places studied with differing population[3].

Channels of distribution and marketing margins. The channels of distribution for wild and cultivated mushrooms in central Mexico were studied following an institutional approach[4, 21]. Structured interviews (550) were made with people and business structures that perform the mushroom marketing process. Mushroom growers/ gatherers, middlemen, wholesalers, retailers, "tianguis (popular and traditional market days)", public markets, supermarkets, convenience stores, "tacos" outdoor stands/ stalls, restaurants, canteens, and consumers were included. The interview protocol was applied individually by formal interviews, followed by an observation protocol. Representative channels of distribution were followed from the point of initial mushroom production to the final point of direct sale to consumers. The marketing margin was estimated in U. S. dollars (USD) through the difference between the retail price and the farm price.

RESULTS AND DISCUSSION

Basic channels of distribution studied, either complex or simple, are shown in **Table 1**, although combinations among them may occasionally happen. Six channels were identified in Mexico city, five for cultivated mushrooms and one for wild mushrooms. All channels went from mushroom growers to consumers, involving different components: A wholesaler from the main city market ("Central de Abastos") bought the mushroom production and sold it directly to several retailers. Middlemen bought the mushroom production and sold it to a wholesaler from the main city market ("Central de Abastos") who marketed it directly to "tianguis", public markets and canteens. A wholesaler from the main city market ("Central de Abastos") bought the mushroom production and sold it directly to several retailers who marketed it to supermarkets, convenience stores, specialized stores, "tacos" outdoor stands/ stalls and restaurants. The mushroom production was sold directly by mushroom growers to supermarkets, convenience stores and specialized stores. The mushroom production was sold directly by mushroom growers to retailers who marketed it directly to consumers. In the case of wild mushrooms, gatherers normally sold mushrooms gathered to middlemen. These middlemen take wild mushrooms to city markets in Mexico and Puebla. Middlemen sold wild mushrooms there to wholesalers who marketed them directly to consumers.

Five channels of distribution were identified in Puebla city, four for cultivated mushrooms and one for wild mushrooms. All channels went from mushroom growers to consumers, involving different components: A wholesaler bought mushrooms from another wholesaler from the main Mexico city market ("Central de Abastos") and sold it directly to several retailers. A wholesaler bought the mushroom production, sold it directly to "tianguis", public markets and

Table 1. Main distribution channels identified in the region studied for fresh and processed *Agaricus* and *Pleurotus* mushrooms, occasionally *Lentinula* mushrooms, as well as wild mushrooms.

Place	Channel of distribution studied (kg/week)	P	Component											
			Middlemen	Wholesalers	Retailers	"Tianguis"	Public markets	Supermarkets	Convenience stores	Specialized food stores	"Tacos" stands/stalls	Restaurants	Canteens	Consumers
Mexico city	1 (30-25,000 kg)	CM ➠	-	✔	✔	-	-	-	-	-	-	-	-	✔
	2 (30-20,000 kg)	CM ➠	✔	✔	-	✔	✔	-	-	-	-	-	✔	✔
	3 (30-20,000 kg)	CM ➠	-	✔	✔	-	-	✔	✔	✔	✔	✔	-	✔
	4 (30-20,000 kg)	CM ➠	-	-	-	-	-	✔	✔	✔	-	-	-	✔
	5 (30-20,000 kg)	CM ➠	-	-	✔	-	-	-	-	-	-	-	-	✔
	6 (30-50 kg)	WM ➠	✔	✔	-	-	-	-	-	-	-	-	-	✔
Puebla city	1 (150-300 kg)	CM ➠	-	✔	✔	-	-	-	-	-	-	-	-	✔
	2 (150-300 kg)	CM ➠	-	✔	-	✔	✔	-	-	-	✔	-	-	✔
	3 (150-300 kg)	CM ➠	-	✔	✔	-	-	✔	✔	✔	✔	✔	✔	✔
	4 (150-300 kg)	CM ➠	-	-	-	-	-	✔	-	-	-	-	-	✔
	5 (30-50 kg)	WM ➠	✔	✔	-	-	-	-	-	-	-	-	-	✔
Toluca city	1 (20-3,000 kg)	CM ➠	-	-	-	-	-	-	-	-	-	-	-	✔
	2 (20-3,000 kg)	CM ➠	✔	-	✔	-	-	-	-	-	-	-	-	✔
	3 (20-3,000 kg)	CM ➠	✔	✔	✔	-	-	-	-	-	-	-	-	✔
	4 (20-3,000 kg)	CM ➠	-	✔	✔	✔	✔	-	-	-	✔	✔	✔	✔
Cuetzalan town	1 (110 kg)	CM ➠	-	-	-	-	-	-	-	-	-	-	-	✔
	2 (110 kg)	CM ➠	-	-	-	-	-	-	-	-	-	✔	-	✔
	3 (5-20 kg)	WM ➠	-	-	-	✔	-	-	-	-	-	-	-	✔

P= Product from grower or gatherer. ➠ = Direction of the channel of distribution. CM= Cultivated mushrooms. WM= Wild mushrooms, available during the rainy season (July to September).

"tacos" outdoor stands/stalls. A wholesaler bought mushrooms from a grower in Mexico city, and sold them directly to several retailers who marketed them to supermarkets, convenience stores, specialized stores, "tacos" outdoor stands/stalls, restaurants and canteens. The mushroom production was sold directly by mushroom growers to supermarkets. Gatherers normally sold wild mushrooms gathered to middlemen. These middlemen take wild mushrooms to the main city markets of Puebla and Mexico to be sold to wholesalers who marketed them directly to consumers.

Four channels of distribution for cultivated mushrooms were identified in Toluca city. All channels went from mushroom growers to consumers, involving different components: Growers sold their mushroom production directly to consumers. Middlemen bought the mushroom production and sold it to retailers.

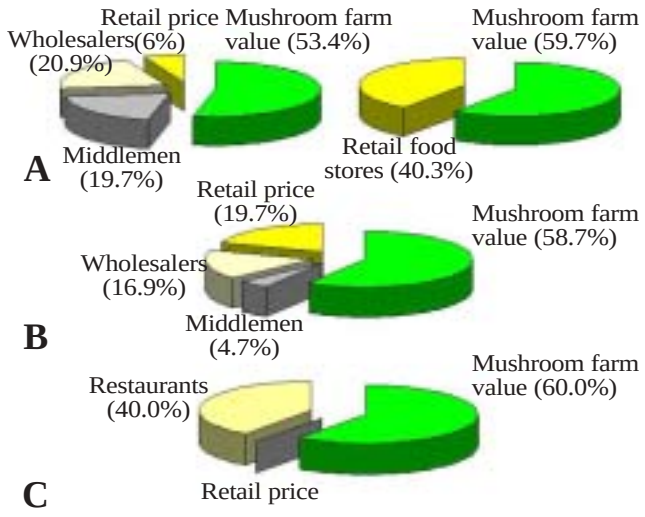

Fig. 1. Estimated marketing margins found in several channels of distribution of fresh mushrooms from: A: Mexico and Puebla cities; B: Toluca city; and C: Cuetzalan town.

Middlemen bought the mushroom production and sold it to a wholesaler from the main Mexico city market ("Central de Abastos") who marketed it directly to retailers. A wholesaler from the main city market ("Central de Abastos") bought the mushroom production and sold it directly to several retailers who marketed it to "tianguis", public markets, "tacos" outdoor stands/stalls, restaurants and canteens.

The simplest two channels of distribution for cultivated mushrooms were identified in the rural community of Cuetzalan: The cooperative of peasants cultivating *Pleurotus* mushrooms sold them directly to local consumers. Part of the mushroom production is sold to restaurants which offer dishes based on traditional recipes. Gatherers took wild mushrooms gathered to the Cuetzalan traditional "tianguis" to be swapped or sold directly to consumers.

The marketing margin, as well as the mushroom grower's share, were estimated considering average prices for cultivated mushrooms (*Agaricus*, *Pleurotus*) in several channels of distribution (**Figs. 1A-C**). When *Pleurotus* was first introduced to the Mexican market in 1974, it reached consumer prices considerably higher than those for *Agaricus*. However, at present, wholesale and retail prices for both mushrooms are very similar. These prices for *Pleurotus* may be even lower in some seasons. In a channel of distribution found in Mexico and Puebla cities, mushrooms not selected are sold to middlemen at $ 1.25 per kg, middlemen sold to wholesalers at $ 1.71 per kg, wholesalers sold to retailers at $ 2.20 per kg and retailers marketed to consumers at $ 2.34 per kg to reach a marketing margin of 46.6% and a grower's share of 53.4%. In a less complex channel of distribution, the grower sold selected and packaged

mushrooms directly to supermarkets, convenience stores, and specialized stores at $ 3.97 per kg, whereas these retail food stores sold to consumers at $ 6.65 per kg to reach a marketing margin of 40.3% and a grower's share of 59.7%. Although this share appears to be high, growers actually performed additional activities, such as cooling, packaging, grading, branding, transportation and delivery. In a channel of distribution from Toluca city, mushrooms are sold to middlemen at $ 1.25 per kg, middlemen sold to wholesalers at $ 1.35 per kg, wholesalers sold to retailers at $ 1.71 per kg, and retailers marketed to consumers at $ 2.13 per kg to reach a marketing margin of 41.3% and a grower's share of 58.7%. The simplest channel of distribution was found in Cuetzalan town, where the cooperative growing mushrooms sold them directly to consumers at $ 1.20 per kg, and there was no difference between the mushroom farm value and the retail price. The cooperative also sold mushrooms to local restaurants at $ 1.20 per kg, while restaurants marketed them to consumers at $ 2.00 per kg, as a cooked dish, to reach a marketing margin of 40% and a grower's share of 60%.

The marketing margin from wild mushrooms in markets from Puebla and Mexico cities is shown in **Table 2**. The retail price varied according to mushroom species and the place of sale. The marketing margin ranged from 14.3-91.7%, while the gatherer's share from 8.3-85.7%.

The main marketing channels identified for wild mushrooms, as well as for cultivated (fresh and processed: *Agaricus*, *Pleurotus*, *Lentinula*) mushrooms produced on a large and small scale, are shown in **Fig. 2**. The main market at Mexico city, called "Central de Abastos", was the main place where about 30% of the total commercial mushroom production was marketed by wholesalers to public markets, "tianguis", food services (restaurants, "tacos" outdoor stands or stalls, canteens) and retailers. Sales were not only to central Mexico, but also to the rest of the country. Only a few wholesalers are specialized in handling edible mushrooms, most of them did handle

Table 2. The marketing margin and gatherer's share estimated for wild edible mushrooms in the channels of distribution from Puebla and Mexico cities, considering the retail price at city markets (USD).

Species	Gatherer's value	Puebla city market	Mexico city markets "La Merced"	Mexico city markets "San Juan"	Gatherer's share (%)	Marketing margin (%)
Amanita caesarea (Scop.)Pers.	2.00	3.00	4.16	6.25	32-67	33-68
Amanita rubescens Pers.	0.52	1.56	1.25	5.20	10-42	58-90
Boletus edulis Bull.	1.56	2.00	-	5.20	30-78	22-70
Collybia dryophila (Bull.)P. Kumm.	3.12	-	-	5.20	60	40
Helvella spp.	3.12	-	-	3.64	85.7	14.3
Laccaria laccata (Scop.)Fr.	0.72	2.08	-	-	34.6	65.4
Lactarius indigo (Schwein.)Fr.	0.52	1.00	3.12	-	16.7-52	48-83.3
Lactarius scrobiculatus (Scop.)Fr.	0.52	1.25	1.04	6.25	8.3-50	50-91.7
Lyophyllum decastes (Fr.)Singer	0.83	1.00	1.25	5.20	16-83	17-84
Morchella esculenta (L.)Pers.	5.20	-	-	18.75	27.7	72.3
Ramaria flava (Tourn. ex Battarra)Quél.	0.52	1.00	1.56	4.68	11.1-52	48-88.9

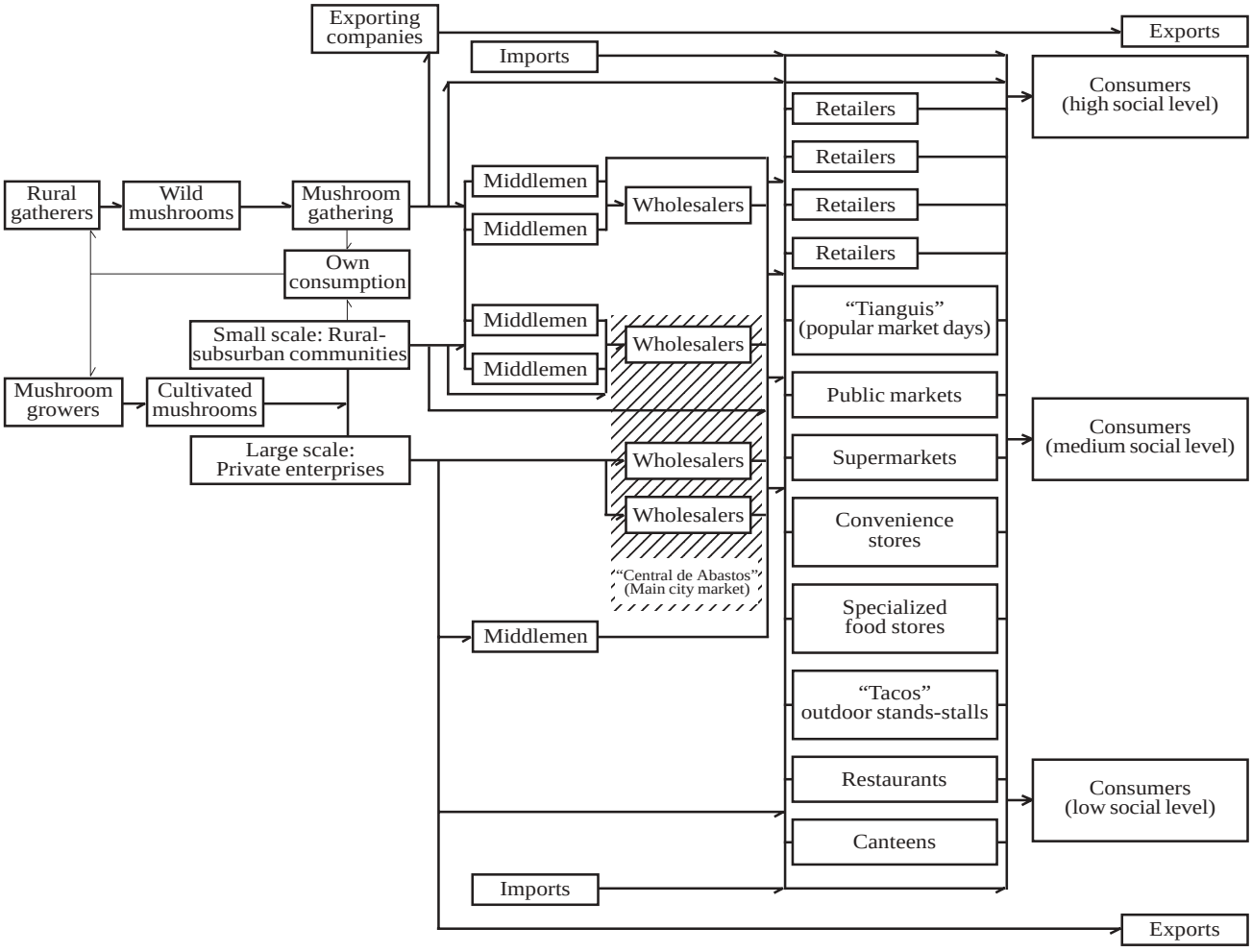

Fig. 2. Main marketing channels for wild and cultivated (fresh and processed: *Agaricus*, *Pleurotus*, *Lentinula*) edible mushrooms identified in central Mexico.

different products. All operations took place in cash. There are also main city markets in Puebla, Toluca, and virtually in all the rest important cities of the country.

A small proportion of the total commercial mushroom production is marketed by a large number of middlemen operating between mushroom growers and wholesalers, public markets, "tianguis", food services (restaurants, "tacos" outdoor stands or stalls, canteens), retail food stores (supermarkets, convenience stores, specialized stores, green groceries), and retailers. They buy mushrooms at the farm gate, and take them to large cities to be merchandised.

Eleven large mushroom enterprises were identified in the marketing system (**Table 3**). There was originally one private enterprise, "Hongos de México, S.A.", acting as a monopoly from 1949 to 1975. New private enterprises became established from 1976 to 2005. Most of them are family-owned enterprises, while some others are corporate enterprises. The mushroom

industry can be considered oligopolistic, as there is a reduced number of firms offering the same or similar products. The entry of new firms is difficult and a few of them have substantial influence on mushroom prices[4]. Further development is needed in the industry to face present global competition characterized by higher specialization, high price risks, science-based cultivation technologies, private research and development, high degree of innovation, environmental protection and personnel having interpersonal and managerial skills.

Large mushroom enterprises normally act independently in an environment of strong price and marketing competition. Although attempts have been made to develop the Mexican Association of Edible Mushroom Growers to agree on prices, level of output and group decisions, thorough long-term agreements are difficult to achieve. From the 1970s to the 1990s, most production from large enterprises was marketed through wholesalers at the "Central de Abastos" from Mexico city. At present, it has been reduced approximately 50% to about 30 tons per day. Large enterprises have independently managed to diversify and to establish alternative strategies. About 70% of their production goes to the fresh market, while about 30% is canned for later marketing at national or international level. Large enterprises perform the direct distribution of fresh and processed mushrooms to retail food stores, either corporate chain stores or independent food stores (supermarkets, convenience stores, specialized stores, gourmet food stores), as well as for mushroom exports, adding place and time utilities through cooling, packaging, branding, transportation and delivery. This type of distribution represents up to 60-70% of the total fresh mushroom production marketed by most enterprises. Only a few mushroom enterprises have canning facilities for creating form utility. Other importing companies also supplied processed mushrooms, either canned or

Table 3. Main large private enterprises identified in the mushroom marketing system from central Mexico.

Mushroom enterprise	State	Mushroom products
Alimentos Selectos de Tlaxcala, S.A.	Tlaxcala	Cultivated, fresh and processed
Champi-Gorega, S.A.	Mexico	Cultivated, fresh, processed, and canned
Champiñones de Los Altos, S.A.	Jalisco	Cultivated fresh and processed
Champiñones de Occidente, S.A.	Jalisco (El Salto)	Cultivated fresh and processed
Cultivos Naturales San Francisco, S.A.	Jalisco (La Barca)	Cultivated fresh and processed
Deshidratadora Nacional de Alimentos, S.A.	Mexico	Wild, cultivated, dried and ground
Grupo San Miguel, S.A.	Guanajuato	Cultivated fresh, processed, and canned
Hongos de México, S.A.	Mexico, Queretaro, Jalisco, Coahuila	Wild, cultivated, fresh, processed, and canned
Hongos del Bosque, S.A. (Conservas la Costeña, S.A.)	Mexico	Cultivated fresh, processed, and canned
Hongos Leben, S.A.	Mexico	Cultivated fresh, processed, and canned
Hongos Rioxal, S.A.	Veracruz	Cultivated fresh, processed, and canned

dried, from China, North America, Europe and South America directly to retail food stores.

In terms of market power, there are three important elements having influence in the mushroom price-setting process: The company "Hongos de Mexico, S.A." which now accounts for about 45% of the total commercial *Agaricus* mushroom production (*ca.* 55 tons per day). The company "Hongos Leben, S.A." which accounts for 89% of the total commercial *Pleurotus* mushroom production (*ca.* 5 tons per day). Wholesalers from the "Central de Abastos" of Mexico city, which market about 30% of the total commercial production (*ca.* 30 tons per day) across the country, mainly in central Mexico. In fact, there is a physical concentration of mushroom growers, middlemen, wholesalers, retailers, and food services at this "Central de Abastos" every day. Many middlemen, wholesalers and retailers are functional occupations of families, lacking suitable facilities and organization. High financial resources, large amounts produced or marketed, and diversification of distribution channels are associated with market power positions. In this context, the wholesale and retail prices are normally set up every day according to supply and demand, as well as bargaining power. These prices vary considerably throughout the year because the supply is variable. There are seasons of high and low commercial mushroom production during the year, due to the effect of changing environmental conditions or other factors on production cycles within growing facilities having minimum controls of temperature and relative humidity. Inefficient transportation and handling also affect mushroom quality and the consumer price significantly outside Mexico city. Fresh mushrooms along with many other fruits, vegetables and other products are normally moved long distances using truck and wagon transportation without suitable cooling systems. Air carriers are more expensive domestic transportation, but play a smaller and important role in the marketing in national touristic places and for mushroom exports. Accordingly, fluctuating mushroom production/supply, inefficient transportation and handling, and the market power in most channels of distribution affect consumers through mushroom quality and price. High annual variation of wholesale (*Agaricus*: $ 2.15-5.65) and consumer (*Agaricus*: $ 1.04-5.17; *Pleurotus*: $ 2.07-6.68; *Lentinula*: $ 8.79-10.34) mushroom prices has been recorded between years, cities, places of purchase, and regions of the country. Mexican mushroom consumer prices can be even higher than those from developed countries[19, 20].

A large number of rural growers have been cultivating mushrooms on a small scale since the 1990s, lacking suitable production and storage facilities and following rustic methods. This small-scale mushroom cultivation is carried out by household systems as an extra-agricultural activity in many rural and suburban communities. Total mushroom production, mainly *Pleurotus*, is quite variable (7-427 kg per day) as constant growers, frequent growers, and occasional growers have been identified[2]. There are about 250 rural growers scattered over central Mexico, whose production represents about 11% of the total oyster mushroom production. Most of this production is sold locally to consumers and is important for the development of local and regional markets. Rural growers may also use cultivated mushrooms for their own consumption. The remaining production is taken or sold to middlemen to be marketed

in big cities to wholesalers, public markets, "tianguis," "tacos" outdoor stands or stalls, and retailers. However, during seasons of high mushroom production, there are price wars between large enterprises and rural growers or middlemen. They market fresh mushrooms suddenly at the "Central de Abastos" from Mexico city affecting mushroom price stability.

In general, the present mushroom marketing system evolved from a small centralized process to a combination of centralized and decentralized marketing processes involving limited activities. During this series of changes, large private enterprises took over several marketing functions (*e.g.*, cooling, storage, grading, packaging, canning, branding, distribution, delivery) supporting the decentralization process, but discouraging the development of new firms specialized in mushroom marketing and processing. At the same time, changes also led to the market concentration of open-market sales in large private enterprises and functional wholesalers at the "Central de Abastos" in Mexico city. In the short term, the overall situation impedes major structural changes in the mushroom marketing system because: Most large private enterprises carry out many diverse production and marketing functions within the same company, such as spawn preparation, mushroom cultivation, processing, and distribution. Specialized marketing firms are not developed as in other sectors, and some of their functions have been transferred to mushroom growers. There is a lack of active marketing strategies to increase mushroom consumption. This is relevant as globalization is promoting a reorganization of marketing systems worldwide towards specialization or diversification of firms, decentralization, integration, food safety and quality regulations, higher availability of marketing information, and the shift from a commodity-oriented to a merchandising-oriented food industry.

To face this challenge, an integral development of the Mexican production-consumption chain as a whole should be encouraged, involving the following: Improved mushroom growing facilities to make production more predictable and less variable. More large and small enterprises to increase mushroom production. The development of specialized marketing firms having suitable facilities, organization, and financial resources. The establishment of suitable marketing strategies divided into market segments, according to social levels and regions, in order to increase mushroom consumption throughout the country. The improvement of health, food safety and quality, and environmental aspects. This integral development will significantly increase marketing activities, leading to gradual integration, specialization and rearrangement of marketing functions amongst component parts of the present mushroom marketing system. Improved conditions within the system are also expected, namely: pricing and operational efficiency, value-adding productive processes, access of buyers with sellers, and market information availability. Increased interdependence and coordination with other larger sectors of the economy may also be possible, such as the fresh fruit and vegetable markets.

The marketing system for wild mushrooms is seasonal and simpler than that for cultivated mushrooms. During the rainy season, mushroom gatherers keep part of wild mushrooms for their own consumption, while the rest is selected and prepared for

marketing[25]. Wild mushroom marketing is direct to consumers, either locally or in other nearby communities or cities. Gatherers can also sell wild mushrooms to middlemen who take them to large cities to be merchandised, either directly to consumers or to wholesalers and retailers. Selected species of wild mushrooms, such as matsutake (*Tricholoma magnivelare*), in rural communities are also bought by middlemen from exporting companies, in order to be processed for the international market[18]. The socio-economic importance of wild mushrooms in the market may be increased significantly, considering the large Mexican forest regions and the traditional knowledge of their associated rural communities. However, fundamental steps are needed including a further organization of peasant communities capable of using processing technologies and the strategic integration of marketing activities from wild and cultivated mushrooms.

A better understanding of mushroom marketing systems from developing countries will lead to higher efficiency and performance, competitiveness in a global economy and satisfaction to the changing needs of mushroom growers and gatherers, marketing firms, and consumers.

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