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OIL CROPS AND SUPPLY CHAIN IN ASIA
LA FILIÈRE OLÉAGINEUSE EN ASIE

DOSSIER

New era for the coconut sector. What prospects for research?

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Abstract – For years and years, the main output of the coconut sector on the international market was copra, crude coconut oil (CNO) and its derivatives. However, since approximately 10 years, we see new products so called "non-traditional" products entering global exchanges. The market growth of these products, mainly coconut water extracted from mature or immature nuts, virgin coconut oil (VCO) cold pressed from the fresh kernel, coconut sugar taken from the sap flowing out of the flower, is exponential. They benefit from the healthy, simple and natural image that is conveyed by the coconut tree in the subconscious minds of the consumers. The craze for this new products create also biggest expectative from the consumers towards the coconut stakeholders. This is why this article will also suggest some tracks of reflection for the research and expert's communities, who would like to support this expansion, thus contributing to the future of the millions of small coconut farmers.

Keywords: Diversification / quality / coconut water / virgin coconut oil (VCO) / market

Résumé – Nouvelle ère pour la filière de la noix de coco. Quelles perspectives de recherche ? Depuis plusieurs années, la filière cocotier dont le principal débouché à l'export était le coprah (amande séchée de noix de coco) et ses dérivés, voit se développer un marché des produits dits « non traditionnels ». Ces produits, essentiellement l'eau de coco issue de la noix mature ou immature, l'huile vierge de coco extraite par pression à froid à partir de l'amande fraîche, le sucre de coco fabriqué à partir de la sève prélevée sur la fleur du cocotier, voient leurs marchés croître de façon exponentielle. Ils bénéficient de l'image saine, simple et naturelle qui est véhiculée par la plante dans l'inconscient des consommateurs. Cet engouement pour ces nouveaux produits génère aussi des attentes plus fortes des consommateurs *vis-à-vis* des acteurs de la filière. C'est pourquoi cet article propose également quelques pistes de réflexion pour la communauté des chercheurs et experts qui souhaiteraient se mobiliser pour accompagner cet essor, et contribuer ainsi à l'avenir des millions de foyers de petits agriculteurs qui souhaitent vivre encore longtemps des revenus de leur cocoteraie.

Mots clés : Diversification / qualité / noix de coco / eau de coco / marché

1 Introduction

The coconut (*Cocos nucifera* L.) production system has a particular structure due to the versatility of the uses of the plant and the duality of its cultivation method. Cash crop or food, coconut has always shown great adaptation and incredible plasticity. Undemanding plant, it adapts to many soil types and climates, resists such extreme growing conditions as atolls and produce continuously from the age of 4 or 7 years to 60 years or more, one of the largest fruit in the world: the coconut. The latter, oleaginous drupe, consists of an edible portion (water + albumen) protected by the shell and a fibrous envelope (husk).

As a cash crop, the main markets for the coconut industry are, from the 19th Century, copra (dried coconut kernel) and crude coconut oil (CNO), major products of export channels (Mittaine and Mielke, 2012). As a food crop, coconut provides daily the coconut milk, sugar, coconut water, fibers, fuels, raw or virgin oil for cooking and cosmetics, construction elements… Some coconut varieties are also used as offerings or are used in traditional medicine (Batugal *et al.*, 1998). On family farms in Asia and Oceania, the coconuts are rarely grown as a single crop but are integrated in complex agroforestry systems. They can be associated with many food crops such as bananas, roots and tubers, spices (pepper/vanilla), with fruit trees and sometimes to cash crops such

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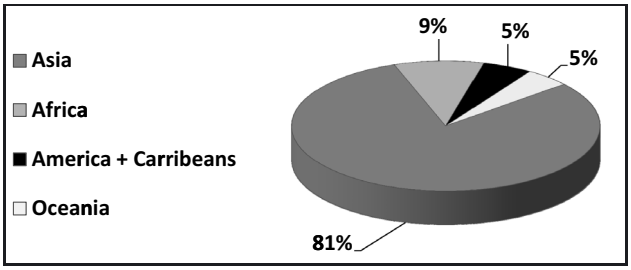

Fig. 1. Cultivated coconut world area in 2014 (FAOStats, 2016).

as cocoa (Mialet-Serra *et al.*, 2001). Thus the concepts of products and by-products are difficult to apply to the coconut industry since all parts of the plant have not only economic but also social and/or cultural importance.

The production of coconut is mainly focused on coastal and island subtropical Asia (Philippines, Indonesia, India, Sri Lanka, Thailand…) and Oceania, which represent 86% of the 12 million hectares planted in the world (Fig. 1). The geographical origin of the coconut plant is supposed to be in this part of the world (Gunn *et al.*, 2011). According to FAO statistics, world coconut plantations produced just over 61 million tons of coconuts in 2014. The farming is mostly (96%) in small family farms ranging from 0.5 to 4 ha. The rest consists of some industrial plantations, often inherited from the colonial period, where the coconut palm is grown in monoculture on hundreds of hectares for copra production. They are located in Southeast Asia (Indonesia, Malaysia), West Africa (Ivory Coast, Ghana) and Eastern Africa (Mozambique).

For over a decade, the coconut industry began a restructuring. Supported from the early 20th century by the commercialization of copra and its oil, in addition, are now growing international markets exchange of so-called "non-traditional" products, in trade jargon of the industry. This term is, however, quite surprising as these "non-traditional" goods, so named in contrast to the copra and its derivatives, have been actually very widely used and consumed for centuries (long before the advent of copra). These are, among others, coconut water and virgin coconut oil. This new momentum in the sector is therefore based on a kind of homecoming, bringing back and updating the benefits of the plant known for millennia, and sharing them with new populations located far from the production sites. After describing the decline of the coconut industry, we will present the diversification of the sector and propose actionable insights to support this new strong momentum by research.

2 The decline in the copra industry

International trade in coconut products was largely based on its primary processing product: copra. However the latter is almost no more traded on the international market today. All major coconut producing countries are equipped with industrial crushing units that allow them to export crude oil. The most advanced feature refining units quite competitive and offer on the market a refined coconut oil meeting the requirements of the international standards.

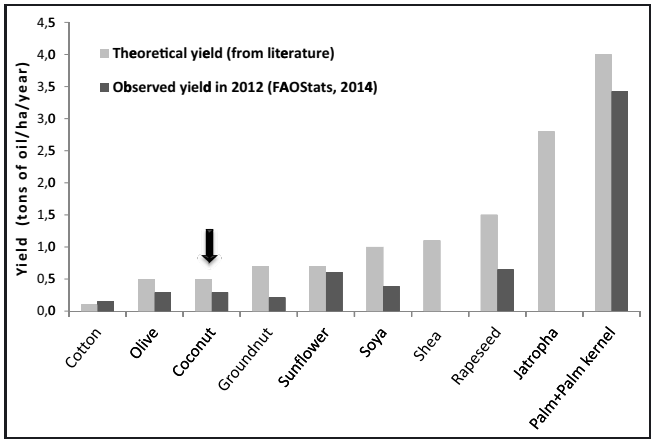

Fig. 2. Productivity of the major oily crops exchanged on the international oil market (except Jatropha, presented here for information). The yields recorded by the literature from experimental station under controlled conditions are often superior to the data collected from the farmers' field (FAO statistics 2012).

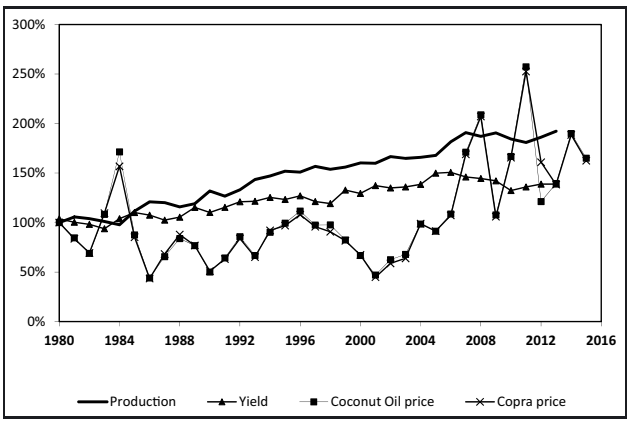

Fig. 3. Evolution of the world production, yield, prices of copra, and coconut oil (1980 = ref. 100) (*sources FAOStats, 2016 for production and yield, and Oilworld monthly for prices*).

Many products derived from this refined oil are also available in countries like the Philippines and India. Refined coconut oil is used in detergents and hygiene products sector and even the cosmetic sector. The market share of food uses of refined coconut oil is relatively low. Palm kernel oil, palm and hydrogenated oils have replaced this tropical lauric oil in food industry. Furthermore, the productivity of the plant remains low (Fig. 2), compared to oil palm which also produces a natural oil of the same category (palm kernel oil) at much lower cost. The competition is imbalanced between a product from industrial plantations with optimized production costs (palm kernel oil) and a product from the village plantations (copra) with less efficient agricultural practices.

Globally and more specifically in Asia, yields have changed very little between 1980 and 2014 (Fig. 3), although there is a positive evolution of the global production of coconut which has almost doubled in 30 years and is today at about 61.5 million tons of fruit/year (FAOStats, 2016). This reflects the regularity of productivity and yields of the Asian coconut grove which remains around 5.5 tons of coconut fruits/ha/year.

This also indicates that the breeding programs conducted over the past ten years, have had little impact; either because they have failed to provide significant advances for producers, and have not prompted them to use the proposed hybrids, or because the new varieties have been little disseminated.

Key fact, after a period of relative stability between 1985 and 2005, prices of coconut oil reflected the high volatility they had suffered during the last petrol crisis of the 70s. In a global market dominated by soybean and palm oils, the growing demand, for last ten years, for biofuels and coconut products other than CNO, distorts the market and creates instability on coconut oil price, severely affecting small producers and processors.

Finally, the low productivity of the plant combined with the substitutability of coconut oil and price volatility, result in a decline in copra production in many Asian countries today. This decline is worsened by the worrying situation of coconut senescent trees, little diffusion of technical advances in copra drying methods. Moreover, in some remote areas, the incomes of producers rely on expensive mechanisms of price support, difficult to sustain for Governments in the face of global financial crisis.

3 The rise of non-traditional products

International trade in the coconut industry is also composed of non-oil markets. Desiccated coconut and coconut milk have been exported for many years and trades are fairly stable. Few producers share the market (Philippines, Sri Lanka, India and Thailand are the leaders). Non-food products also account for a significant share (by value) of international trade in the sector. These are the products of the processing of husk into fibers. The fibers are then processed into growing culture media or geotextiles which, as products from renewable raw materials (unlike peat or plastic) are now flourishing in the horticultural and civil engineering sectors (Rajan and Abraham, 2007). The activated carbon made from coconut shell has physical properties enabling it to obtain also a premium on the international market (Iqbaldin *et al.*, 2013).

The Philippines export about 38 differing coconut-based products and by-products (FAO, 2013), representing the valuation of about 75% of their production to around 1 billion US dollars/year (Agustin, 2016). A real success that promises good days for Filipino producers provided the benefits of the added value are well distributed throughout the production chain. In contrast, the two other major producing countries such as Indonesia and India traditionally consume a large part of their production. Indonesia in particular is struggling to meet domestic demand, with a rapidly growing population; the market remains guided by demand from local consumers. Exact figures are not available today but it is estimated that 70% of the coconut production is consumed in the country. Eighty percent of the remaining 30% are Indonesian exports which are copra oil and meal, whereas India is a leader in the processing and export of coconut fibers. In Sri Lanka, people consume 116 coconuts per year (FAO, 2013) mainly for food. This is the highest consumption in the world.

The last element of the coconut "non-traditional" sector concerns the niche markets. These markets are present at the national, regional, and international levels. The products

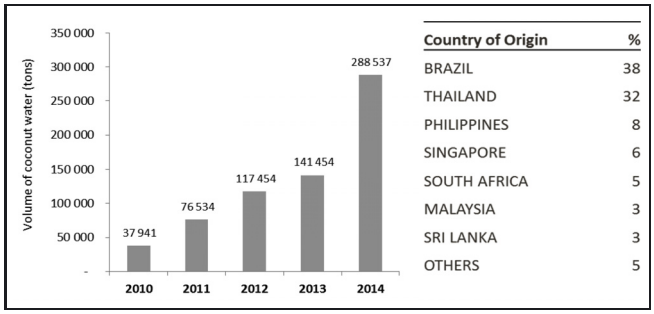

Fig. 4. US import volume of coconut water (tons) (*Source: Salum, 2016*).

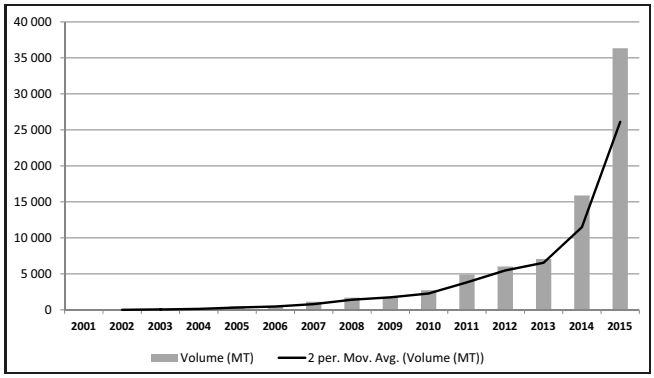

Fig. 5. Philippines export of VCO, virgin coconut oil (*Source: Salum, 2016*).

concerned are food products taking advantage of the current popularity of consumers in search of well-being and healthy products. Coconut water (liquid located inside the nut) and virgin coconut oil, sugar obtained from the sap collected on the coconut flower, are high potential development products. Coconut water market emerged in the early 2000s in Brazil and encountered a fast growing demand in the USA after marketing campaigns. In 2014, nearly 300 000 tons of coconut water were imported in the US from Brazil (38%) and Asia (52%) which represents approximately 150 000 tons of coconut water exported from this last region (Fig. 4).

The virgin coconut oil is a product with high added-value exchanged at 4177 USD/t FOB Philippines in 2015 (Agustin, 2016) and the market is booming (Fig. 5). Unlike for refined copra oil's processing where the drying and refining steps eliminate most interesting nutritional molecules, the cold extraction of oil from fresh coconut kernel, when properly controlled, yields a high quality product that does not require any further processing or chemical modification. This oil can then be related, in terms of image and marketing, to virgin olive oil (Dayrit, 2015).

4 What type of research to support this new coconut sector's era?

Coconut oil is highly substitutable and was strongly challenged during the last 30 years by palm kernel oil or hydrogenated oils from temperate seeds; this led to significant declines in trading volumes, particularly in the food industry.

However, it is interesting to note current interest of some food processing industrials to use it again instead of palm kernel oil or palm oil which suffers from a poor image among some consumers' category. Consequently, large international groups are questioning about coconut cultivation, in the same way they are questioned by their customers or the civil society on oil palm cultivation. Coconut oil could therefore regain its place in the market of tropical oils. To support this rehabilitation, we should ensure that appropriate studies are conducted to evaluate the environmental and social impact of this sector, particularly in Asia, the main production area. Modernizing copra production steps and training of stakeholders in the sector to the quality requirements of international markets or even the establishment of international standards for the quality of copra would be structuring elements for the revival of this outlet.

The sector contributes indeed, by its domestic primary production structure to support employment of tens of millions of households in Asia and worldwide. Studies on the typology of farms would probably still show a family farming system consuming little or no inputs, few energy and creating little, if any, negative externalities. The coconut cultivation methods have changed little (except in Brazil and India) for decades. Coconut farms are readily convertible to organic agriculture. Research must be able to support the introduction of new technical and new operating modes. Producers can contribute, provided they are given the means to develop sustainable and integrated agricultural systems. Fair trade labels often guarantee stable and remunerative markets. They also guarantee, if the label includes environmental issues, sustainable field production, environmental friendly processing units, and responsible marketing channels. This will profit stakeholders in the sector, the future of the planet and future generations.

In parallel, fast growing niche health-food markets (coconut water, virgin coconut oil) pull the opportunities in the sector up. These products should indeed respond to high quality and regularity requirements. However, their production system, yet often artisanal, is struggling to respond. Thus, research is needed on the health effects of the proposed products to achieve compliance health claims market and help to enhance the efforts of the actors. Research on soft and innovative technologies to preserve the nutritional and technological properties should also be considered.

Moreover, the nutritional properties of coconut products are closely related to the quality of the raw material, the culture conditions and the first post-harvest treatment steps. This is particularly true for coconut water (Prades *et al.*, 2012) and virgin oil. It is today urgent to characterize the biodiversity of varieties of coconut trees under the new criteria of market various demands and not just on copra performance criteria. It is indeed crucial to identify what are the varieties best suited to new opportunities in the sector. These varieties, once identified and characterized, may be used in replanting programs, selection or genetic improvement that will generate coconut hybrids for tomorrow. Replanting of coconut trees with quality planting material is urgent and essential.

5 Conclusion

Thus, although the copra industry's decline is a reality, there are at least two development opportunities for the coconut sector: first, the renewed interest of major players in the food sector for tropical lauric oils (non-hydrogenated oils, thus having no trans fatty acids and whose physicochemical and nutritional properties come from a natural fatty acid profile and raw composition in microelements). Secondly, the new health-oriented products have a good market positioning and benefit from the "extensive" method of cultivation of coconut trees. These two development opportunities appeal to the healthy, simple and natural image conveyed by the coconut into the consumer's subconscious. It would be desirable that the industry players, accompanied by researchers and relevant experts, create the conditions so that the image remains in line with the practices of producing countries. Thus, the coconut products' recent boost will be sustainable and will contribute to raise prospects, for millions of people living in the tropics.

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