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Women and small-scale processing of pelagic fish in Senegal: a sector out of breath



Women and artisanal processing of pelagic fish in Senegal: a sector in dire straits

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Summaries

French Français

The objective of this article is to present the tensions of the market for the artisanal processing of fishery products in the face of increasingly difficult access to the raw material in Senegal: pelagic fish. The method consisted of compiling and analyzing statistical data on the supply of raw materials to women processors, and collecting qualitative information from fishing stakeholders on the situation in the sector. Overall, statistical data shows that the supply of raw materials to the artisanal processing segment has fallen by less than 20% over the past ten years. Thus, it fell from 65,000 tonnes in 2009 to less than 41,000 tonnes in 2018. A drop linked to the context of overexploitation of pelagic fish and the appearance of new uses. The information collected in the field shows that women processors are also faced with rising prices for intermediate consumption, especially fuel, with restrictions on cutting wood on the Senegalese coast. Women processors are also very exposed to the precariousness and unsanitary conditions of small-scale processing areas. These are all elements that seriously compromise the sustainability and economy of the small-scale pelagic fish processing activity. In the current context of promoting women's employment and their economic empowerment, the small-scale processing segment must be framed by strong public policies for the sustainability of the activity, especially fuel with logging restrictions on the Senegalese coast. Women processors are also very exposed to the precariousness and unsanitary conditions of small-scale processing areas. These are all elements that seriously compromise the sustainability and economy of the small-scale pelagic fish processing activity. In the current context of promoting women's employment and their economic empowerment, the small-scale processing segment must be framed by strong public policies for the sustainability of the activity, especially fuel with logging restrictions on the Senegalese coast.

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Index entries

Key words : enhancement , women , empowerment , jobs , fish

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Full Text

Introduction

- 1 The small-scale processing of fish products, particularly small pelagic species ¹, is an essential component of the fishing sector that should be supervised and developed for their contribution to the economy of West African countries (Asiadu et al. , 2022; Nunoo et al., 2009). It is essential for nutritional security (meeting animal protein needs), as well as for the livelihoods and subsistence of millions of people (Acosta-Alba et al., 2022; Asiedu et al., 2022; E hadj B. Dème & Failler, 2022; Failler, 2020, 2014). In Senegal, consumption per person ²of pelagic fish is estimated annually at 12 kilograms over the period 2009 - 2018. The artisanal processing sector uses pelagic fish as a raw material (E. hadj B. Dème & Failler, 2022; Moity-Maïzi, 2006a). In Senegal, landings of small pelagics represented an annual average of 317,000 tonnes, i.e. 72% of the total fish landed over the period 2009 – 2018 (Deme et al., 2020). Nearly 18% of this quantity is intended for the artisanal processing market, i.e. 56,550 tonnes (Ricard & Brehmer, 2019). Analysis of the data on this article shows a 20% drop in the quantities of small pelagics supplied to the artisanal processing segment over the period 2009 – 2018. Thus, women processors receive less and less fish for the benefit of the fresh consumer market, the export market (frozen) and industrial processing into fishmeal (Asiadu et al., 2022; E. hadj B. Deme et al., 2022). Discussions with small-

scale processing actors in the field show that for access to raw materials, women processors of fishery products have a reduced financial base and a low level of organization. They face stiff competition from wholesalers, exporters of frozen products and fishmeal factories. They are usually on the fringes of the decisions taken by the fisheries administrations and which govern the activity of fishing and artisanal processing (EHB Dème et al., 2022; Ngom, 2021; Stone, 2005; Lippel & Demers, 1996). This situation compromises the contribution of the artisanal processing sector to the consumption of fish and fish products at the national level and to the sustainable livelihoods of thousands of women (Dème et al., 2019). It also jeopardizes years of financial and technical support for the empowerment of women processors by the state and development partners. (Harper et al., 2017; Moity-Maïzi, 2006b; Durand, 1981a).

2 Our article is thus part of the issue of the governance of fisheries and fishery resources in Senegal (E. hadj B. Dème, Brehmer, et al., 2021; M. Dème & Thiao, 2021; E. hadj B. Dème, Failler, et al., 2021; E. hadj B. Dème et al., 2019; Failler & Binet, 2010; Dahou, 2010; Delbos, 2006; Chauveau et al., 2000; J.-L. Ndiaye, 1997). It is based on research recently carried out in Senegal which reports an overexploitation of fishery resources linked to ecological and economic factors (Ouréns et al., 2022; Jönsson, 2019; Thiaw et al., 2017; Diankha et al., 2015; Failler, 2014; Lam et al., 2012; Hannesson et al., 2006, 2006). A context of overexploitation which has led to a paradigm shift in the management of the fishing sector. Management is no longer fundamentally focused on increasing production, it now includes the enhancement of catches (M. Dème, 2021; Mbengue et al., 2009; Moity-Maïzi, 2006a; Mbaye, 2005a). This is what explains the technological innovations³ in the artisanal processing sector in Senegal (Camara, 2016). However, this product upgrading process seems to come up against difficulties, in particular the limited access to materials and intermediate consumption products such as fuel. Thus, we were interested in the context of this work to present the issues and challenges of the artisanal processing market in a context of competition from the fresh and frozen consumer markets and the appearance of new uses for pelagic fish, particularly processing into fishmeal.

3 The article is structured in four parts. In the first part, the context of the research is presented by characterizing artisanal fishing and the artisanal processing segment. In the second part, the research method is presented. In the third part, the evolution of small pelagic catches and the quantities processed artisanally are presented, as well as the difficulties of access to the intermediate consumer products necessary for the processing activity. Finally, the fourth engages a discussion on the current issues and challenges of artisanal processing in Senegal. It concludes with recommendations for public policies to improve the working conditions of women processors,

Theoretical and problematic framework

Contribution of fishing to the empowerment of women in Senegal

4 The integration of women into the Senegalese economic fabric only took place recently following the economic crises of the 1970s and the economic adjustment policies that followed (Vause et al., 2015; Duruflé, 1994; Sow, 1993). Thus, the social charges borne by women in families have increased (Kergoat, 2010; says Ndong Dimé & Calvès, 2006; Denis & Sappia, 2004). The woman's reproductive function seems to give way to a repositioning around the economic and political space combined with her status as mother, wife and citizen (Dime, 2005; Bonnefond & Couty, 1988). In other words, women leave the marital space to enter the economic field in Senegal (Dime, 2005). This change in status was first favored by the economic situation (Gaye & Abdoulaye, 2009). The context of the 1970s – 1980s marks the succession of several

crises in Senegal of different natures, in particular ecological, economic and political (Faye et al., 2017; Gueye, 2011; M. Diouf, 1992; Bonnefond & Couty, 1988). A set of crises that will weaken the newly independent Senegalese economy and create a difficult economic situation for households (Ndongo Dimé & Calvès, 2006; Ndongo Dimé, 2007). Structural adjustment programs have not made it possible to develop a resilient economy to cope with uncontrolled shocks with an unfavorable international environment (Diop, 2004; M. Diouf, 1992). Thus, Senegal displays weak economic performance which compromises the living conditions of its population (says Ndongo Dimé & Calvès, 2006; Ndongo Dimé, 2007). In view of this situation, women will play an important role in household survival logic (Kebe & Charbit, 2007; Adjamagbo et al., 2006; Duruflé, 1994; Sow, 1993). This role is also favored by the context of the emergence of a militant movement for the empowerment of women (S. Ndiaye, 2010). Starting from the observation that women are excluded from the development process, the objective is now to position them at the heart of development by facilitating their access to education, training, female entrepreneurship and credit (Sarr & Fall, 2021). Thus, gradually in Senegal, women are omnipresent in the national and especially informal economy, they move from invisibility to recognition (Ngom, 2021; Charmes, 2005). Artisanal fishing has positioned itself as a strategic sector in this dynamic of promoting women's employment and empowerment (Delbos, 2006). It is the receptacle of thousands of women working throughout the fish value chain, from production to consumption.

- 5 In Senegal, the artisanal fishing community is generally perceived as a man's world. This is true when dealing with capture activities, but activities downstream of fishing are more feminized (Delbos, 2006). Thus, fishing activity is stratified into segments (fishing, wholesale, artisanal processing) which corresponds to a division of social labor (Feldman, 2018; Cognet, 2010; Shinn et al., 2010). The fishing activity is monopolized by men. It requires a lot of physical strength and long stays at sea. And in a Senegalese society, where it is often the mother's responsibility to take care of the children, they are often confined to the family compound (Feldman, 2018). The wholesale trade segment is also dominated by men. This market segment requires a significant financial investment, which women in the fishing industry do not have (difficult access to credit) and a long family absence. For all these reasons, the activity of artisanal processing seems to be the most suitable. The investment is inexpensive and the know-how is transmitted from mother to daughter. In addition, the activity is carried out within the framework of the concession. This allows them to reconcile family and social demands with an economic activity. Thus, women carry out most of the artisanal processing and present themselves as essential actors in the process of marketing fishery products (Charmes, 2000). The small-scale sale of fish at the outlet markets is almost exclusively carried out by women (ABK Diouf et al., 2022; J.-L. Ndiaye, 1997). Even at the level of industrial development, they dominate in the canned fish industries in Senegal. Suffice to say that while men ensure the production of fish, women dominate the entire value chain.

Artisanal processing of fish products: a job granary for women in rural Senegal under threat

- 6 According to Chaboud et al. (1989), artisanal processing of small pelagics in Senegal is the oldest form of resource development (Moity-Maïzi, 2006b; Mbaye, 2005b; J.-L. Ndiaye, 1997). However, its importance has evolved over the years. If before, artisanal processing only made it possible to valorize waste from the fish trade and, as a result, limit post-capture losses and unsold items (Mbengue et al., 2009). In the current context, the activity is no longer marginal or a user of surplus production (M. Fall et al., 2019; Camara, 2016; N. Fall et al., 2014). In effect,

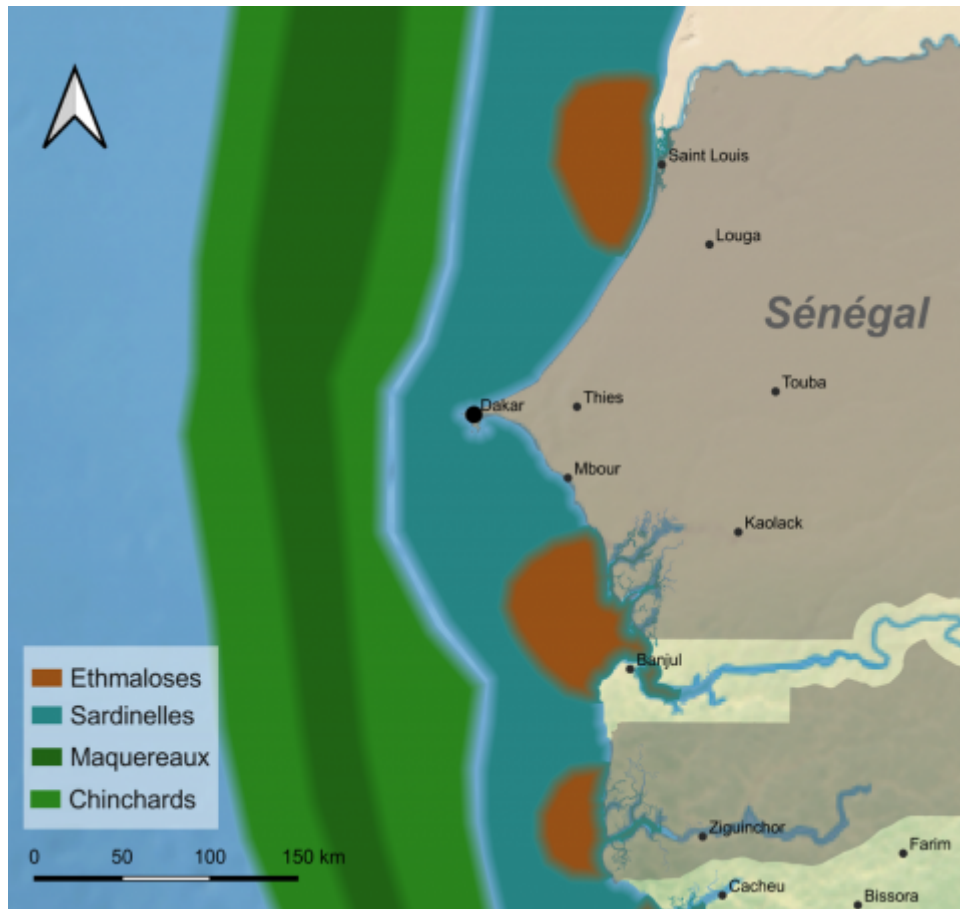
- 7 The development of the segment in Senegal is also linked to the presence of foreign communities (Ghanaian and Guinean) and development partners who have popularized and financed the construction of multifunctional smoking ovens (braising and smoking) and generated high production capacity (Mbengue et al., 2009; Moity-Maïzi, 2006b; Durand, 1981b). This new dynamic of development of artisanal processing means that the investment of women processors and the support of technical and financial partners is much greater. The sector has become more professional with the opening of new markets. This has had positive consequences on the segment's contribution to the national economy, especially in terms of nutritional security, jobs and the integration of women into the economic fabric. Statistics show that more than 7,500 women are active in the artisanal processing areas established along the Senegalese coast. However, this preponderant positioning of women in the small-scale processing segment seems to be affected by several ecological and economic hazards.
- 8 In recent years, the state of stocks in Senegal has been in a critical state, especially for pelagic fish which constitute the raw material for artisanal processing. Recent work by CECAF-FAO has shown that pelagic fish stocks in the northwest zone are at unsustainable levels and fully exploited depending on the species (Bâ et al., 2019; Belhabib et al., 2018). This shows that access to the former will be increasingly difficult for women processors. In addition, small pelagics are vulnerable to climate change (Failler, 2014; Lam et al., 2012; Hannesson et al., 2006). Alongside these ecological uncertainties, economic uncertainties also make it difficult for women fish processors to access pelagic fish. These are new uses for pelagic fish, such as the export of large quantities in frozen whole and the emergence of fishmeal industries on the Senegalese coasts (Acosta-Alba et al., 2022; Deme et al., 2020; Corten et al., 2017). These are all controlled and uncontrolled mechanisms that destabilize the fish distribution chains in Senegal, and which seem to relegate supply to the small-scale processing segment to second place and favor the export market and fishmeal and fish oil. (Deme et al., 2020; Failler, 2020). This is how this article will analyze the raw material supplies of women processors, and intermediate consumption. In doing so, it will answer research questions on the sustainability of artisanal processing activity in Senegal,

Research methods

- 9 This study covers the entire Senegalese coastline (Figure 1). A coastline marked by very dense fishing, fish trading and artisanal processing activities. Indeed, Senegal has a coastline of more than 718 km of coastline and a maritime area of 198,000 km² (Deme et al., 2019). These physical assets have favored the development of fishing and related activities. The sea that borders Senegal is structured around five coastal maritime regions which are the Grande - Côte (in the north), Cape Verde (in the center), the Petite Côte (in the south), the Saloum (deltaic region) and finally beyond Gambia, Casamance (Touron-Gardic et al., 2022) (Figure 1). The Senegalese coast is full of fish (Brochier et al., 2018; Thiaw et al., 2017). This is explained by the existence of hydro-ecological conditions that are particularly favorable to the reproduction of the different species, with in particular significant seasonal variability, vigorous marine currents, a particular wind regime and finally specific parameters for the enrichment of the waters with plankton (Brochier et al., 2018; Diankha et al., 2015). All of these hydro-ecological conditions explain the country's significant fishing potential. It also explains the important contribution of fishing to the economy of the country,⁴ national food security and the sustainable livelihoods of thousands of Senegalese (Asiadu et al., 2022; E. hadj B. Deme et al., 2022; Soumah et al., 2021; Failler et al., 2019). Small pelagics are the main resources exploited in Senegal. These small pelagics are the raw material for the artisanal processing segment which is done by smoking and braising

the fish along the Senegalese coasts (from the Grande Côte in the north to the south of Senegal, in Casamance) (Figure 1).

Figure 1: the Senegalese coast and the geographical distribution of the main pelagic fish species exploited by Senegalese artisanal maritime fisheries



Source: (Dème et al., 2022)

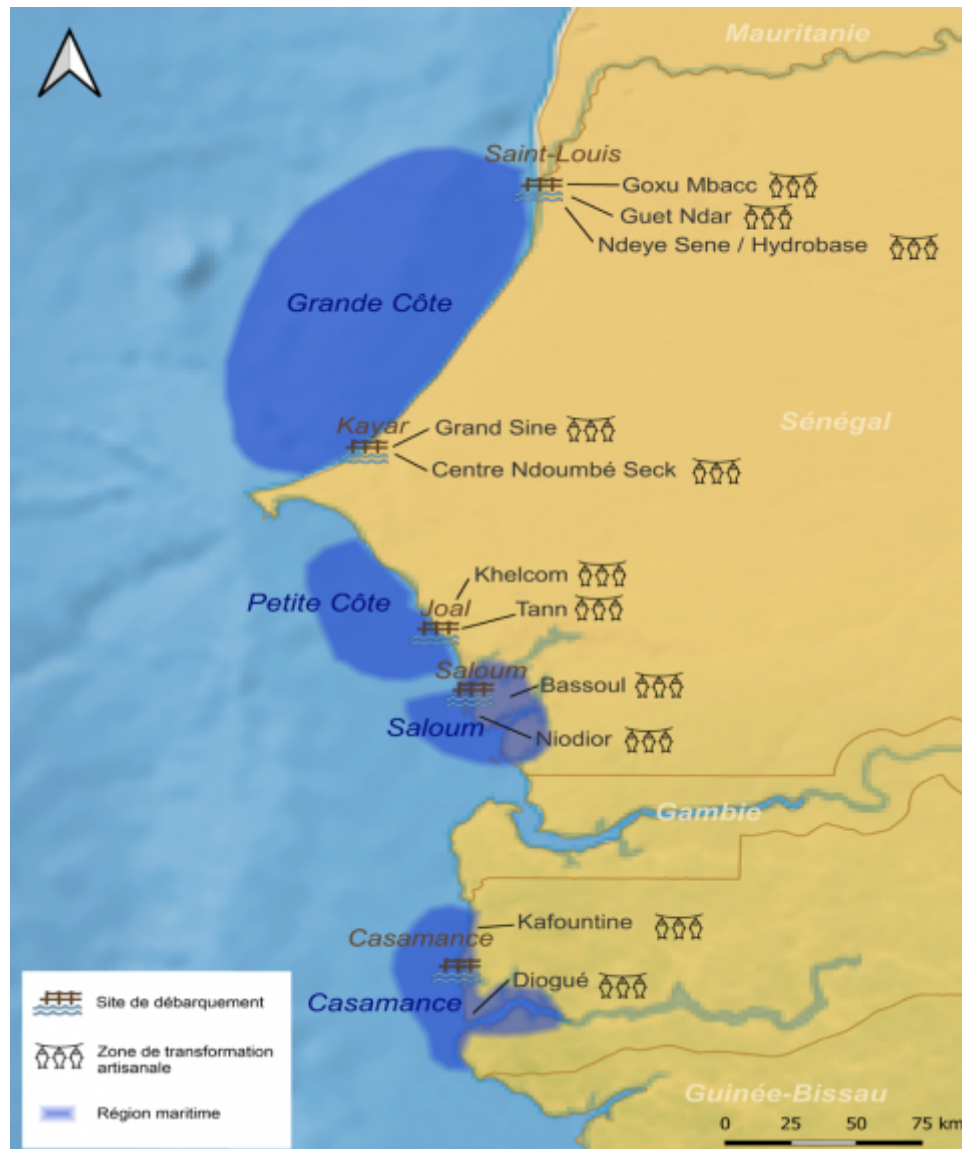
- 10 The exploitation of fishery resources in Senegalese waters is carried out by artisanal, semi-industrial and industrial fisheries ⁵. But, if we are interested in pelagic fish, they are mainly exploited in Senegal by an artisanal fleet made up of purse seines and encircling gillnets. A total of 1,249 purse seine units and 700 encircling gillnet units were counted in 2019 in Senegal. These fishing units most often land the following small pelagic species: sardinella (flat and round) (*Sardinella maderensis*) (*Sardinella aurita*), bonga (*Ethmalosa fimbriata*), horse mackerel (black, yellow and white) (*Trachurus trachurus*) and mackerel (*Scomber scombrus*) (Author, 2021; Mbengue et al, 2009). Small pelagics are characterized by a wide distribution and a dynamic along the West African coasts linked to the intertropical front, species seeking optimal temperature and food availability conditions (Laë et al., 2004; Hoggarth, 2006; Gorez et al., 2018). Illustration 1 allows us to appreciate this distribution of flagship pelagic species in the Senegalese Exclusive Economic Zone-EEZ.

Collection of data

- 11 For national coverage of the work, we conducted field surveys on the entire Senegalese coast and in the most important landing sites in terms of quantities of fish landed and processed artisanally and industrially (Figure 2). This is how the main surveys were carried out in 11 different processing areas. On the Grande Côte, surveys took place in Saint-Louis and Kayar in the processing areas of Goxu Mbacc, Guet Ndar, Ndeye Sene / Hydrobase, Grand Sine and Center Ndoumbé Seck. Two processing areas were surveyed on the Petite Côte in Joal: Khelcom and Tann (Figure 2). The same is

true for Saloum, the processing areas of Bassoul and Niodior have been covered (Figure 2).

Figure 2: Maritime regions covered, landing sites and artisanal processing areas surveyed

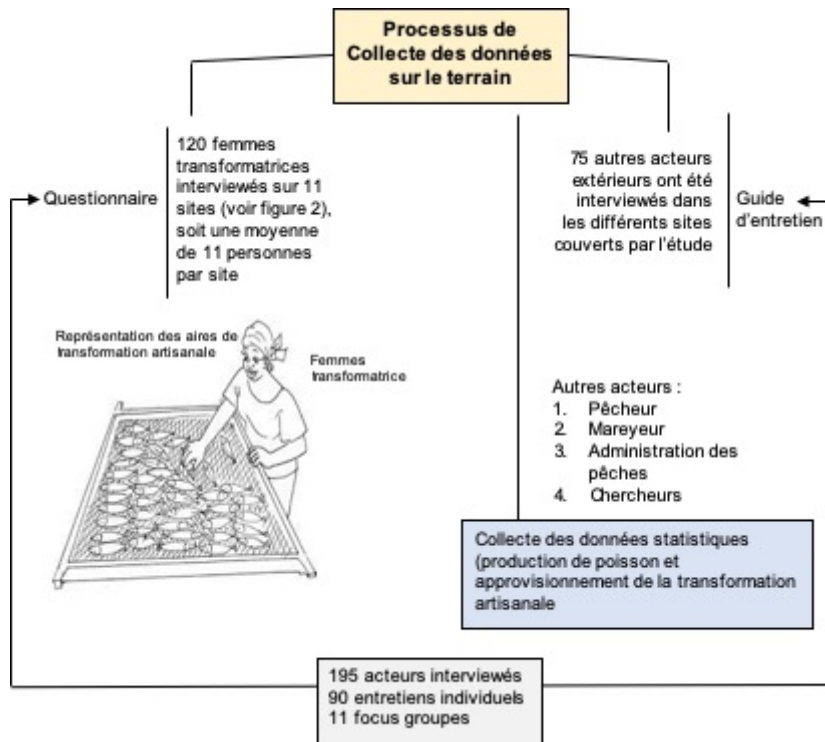


12 Once the geographic sampling was defined, the field survey tools were developed and tested in the field. The main data collection tool was the questionnaire submitted to the women processors met in the different processing areas. The questionnaire is a social analysis of the artisanal processing sector by applying the methodology of the social profile. 10 central questions⁶ (+ sub-questions) will make it possible to structure the social analysis around a main question: is the artisanal processing of fishery products a sustainable activity in a context of overexploitation of pelagic fish and the appearance of new competing uses?

13 In addition to this questionnaire submitted to the women fish processors, we made a request to the fisheries administrations to have statistical data on the quantities of fish landed annually in Senegal and the quantities processed. Thus, we were able to have national statistical fishing data covering the period 2009 - 2018. These data made it possible to assess the evolution of the supply of women processors in raw material over ten years. In addition, we have submitted an interview guide to those involved in fishing (fisherman - wholesaler and administration). The objective of the interview guide was to obtain outside opinions on the activity of artisanal processing in Senegal, in particular its importance in terms of food security, the fight against poverty and the empowerment of women. The guide also made it possible to have the point of view of fishermen and wholesalers on the process of supplying women fish processors. The selling prices of fish according to the different marketing segments. Finally, with the administration, the discussions mainly focused on the infrastructure and equipment set

up to support women processors and the public policies developed to oversee the activity.

Figure 3: Map of actors interviewed on the various landing sites hosting artisanal processing areas



- 14 The field activities were carried out over the period February - December 2022. In total, more than 195 actors were interviewed in the field (120 women processors and 75 other fisheries actors). The category of other actors covers fishermen, wholesalers, fisheries administrations and research. The interviews took place in different formats, including individual interviews and focus groups. Focus groups were practical in the context of this study. Indeed, it was particularly difficult to conduct individual interviews with women processors who were busy all day. The focus groups were a way of bringing them together at the end of the day to interview them. They made it possible to cross-reference information. Each focus group lasted an average of two hours.

Analyse des données

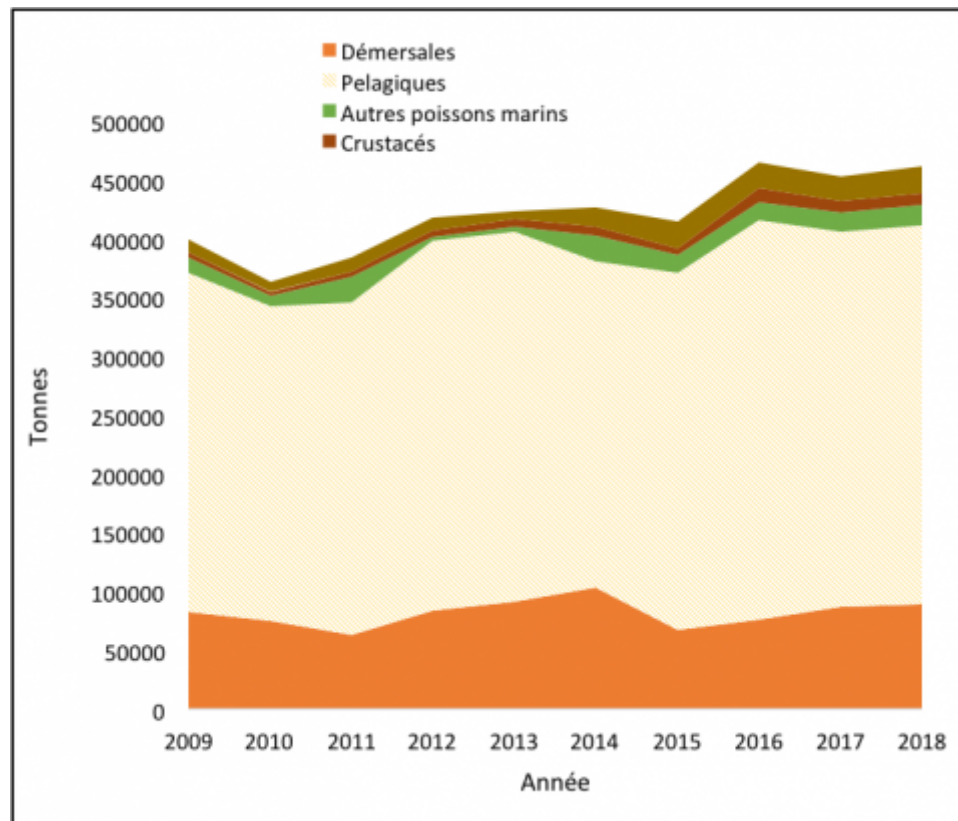
- 15 Les données sur les captures et distributions des petits pélagiques dans les divers marchés obtenus de la base de données de la DPM ont été saisies et stockées sur Microsoft Excel. La base de données a été mise en place en suivant une nomenclature établie en fonction des besoins comprenant la production par de petits pélagiques, l'évolution de l'approvisionnement des différents segments (frais - transformés - congelés destinés aux exportations). Les données traitées couvrent la période 2009 - 2018. Les rapports statistiques des dernières années n'étant pas disponibles.
- 16 En plus des données sur la capture et la mise en marché des petits pélagiques, la base des données intègre aussi celles nécessaires au calcul du revenu net d'exploitation de l'activité de la transformation artisanale. Pour ce faire, le compte d'exploitation annuel d'un atelier de transformation (braisage) a été mis à profit. Le revenu net d'exploitation est obtenu en soustrayant la valeur des produits et les consommations intermédiaires et les amortissements. La valeur des produits représente ici la valeur totale obtenue suite à une opération. Les consommations intermédiaires comprennent les matières premières (poissons), les frais liés au transport du poisson frais, la main d'œuvre, gerbage du poisson frais et le décorticage du poisson frais, le sel, l'emballage et l'entretien et réparation des fours.

Résultats de la recherche

Débarquements des petits pélagiques au Sénégal

- 17 En termes de quantité, les débarquements de poisson toutes espèces confondues sont de plus en plus importants au Sénégal. Ils tournent sur une moyenne de 421 000 tonnes sur la période 2009 – 2018 (Figure 4). Les espèces débarquées sont les démersaux, les pélagiques, les crustacés, les mollusques et céphalopodes. La catégorie « autres poissons marins » regroupent les espèces non identifiées ou qui présentent des quantités marginales au débarquement (Figure 4).

Figure 4 : Évolution des débarquements annuels toutes espèces confondues (2009 - 2018) au Sénégal



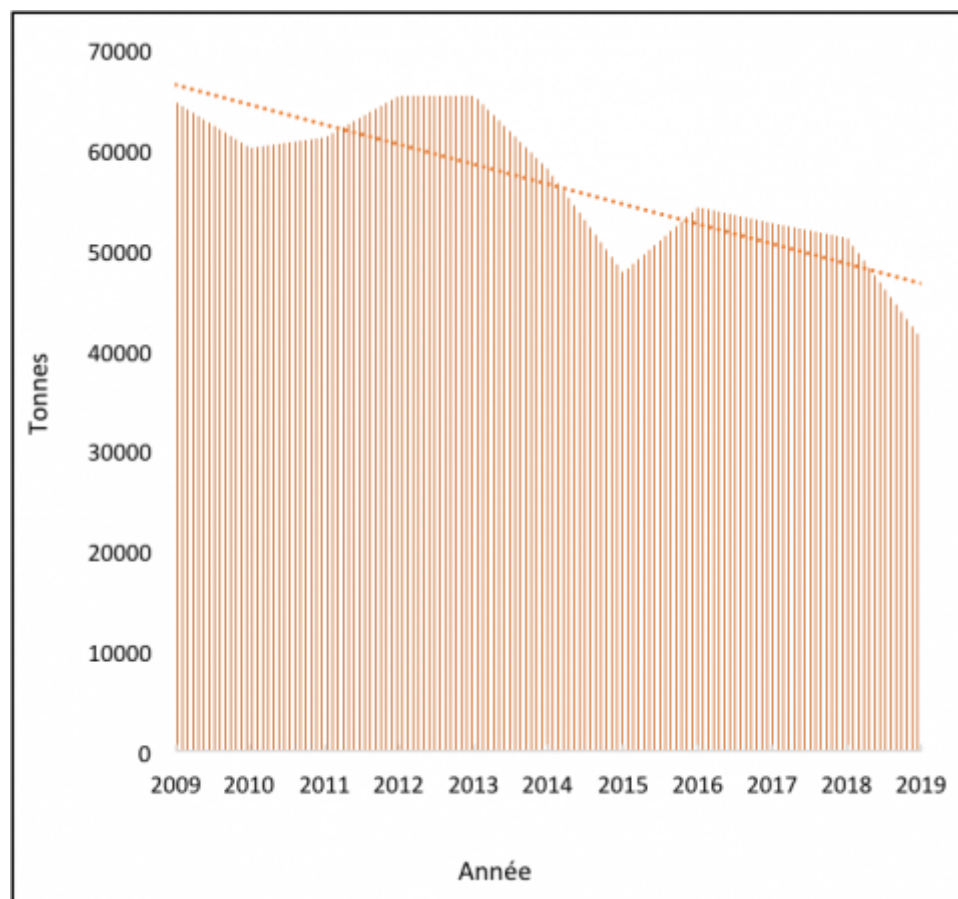
Source : Auteurs, 2022

- 18 Over the decade 2009 - 2018, the lowest production was recorded in 2010 with less than 363,000 tonnes. Fish production reached the 400,000 tonne mark in 2012. Since that year, landings have recorded a constant annual growth of 15,000 tonnes (Figure 4). Pelagic fish are the most landed and consumed fish species in Senegal. Over the period 2009 - 2018, they constitute more than 72% of the total fish landed in Senegal. Trends indicate that small pelagic landings are on the rise with an annual average of 315,000 tonnes. The curve of small pelagic landings is generally experiencing discontinuous growth marked by sharp increases and slight decreases (Figure 4) (Dème et al, 2022). *S. aurita* and punts (*S. maderensis*) which represent on average 39% and 32% of the total landings of small pelagics (Figure 4). Bonga (*Ethmalosa fimbriata*), mullet (*Mugilidae*), horse mackerel (*Trachurus trachurus*), and other pelagic species account for the remaining 29% of total small pelagic landings. Horse mackerel (*Trachurus trachurus*) represent on average 8% of small pelagic landings (Figure 4). Landings of bonga and mullet are relatively low and represent less than 5%.

Distribution of small pelagics in Senegal: downward trend in the supply of the artisanal processing segment

- 19 The quantities of small pelagics processed in Senegal are around an annual average of 56,550 tonnes over the period 2009 - 2019. The supply of the artisanal processing segment with raw material is constantly declining. If in 2009, the quantity of small pelagics processed was 64,600 tonnes, in 2019 it was estimated at less than 41,200 tonnes, i.e. a significant drop of more than 25,000 tonnes (Figure 5).

Figure 5: Evolution of the supply of the artisanal processing segment from 2009 to 2019 (tonnes)

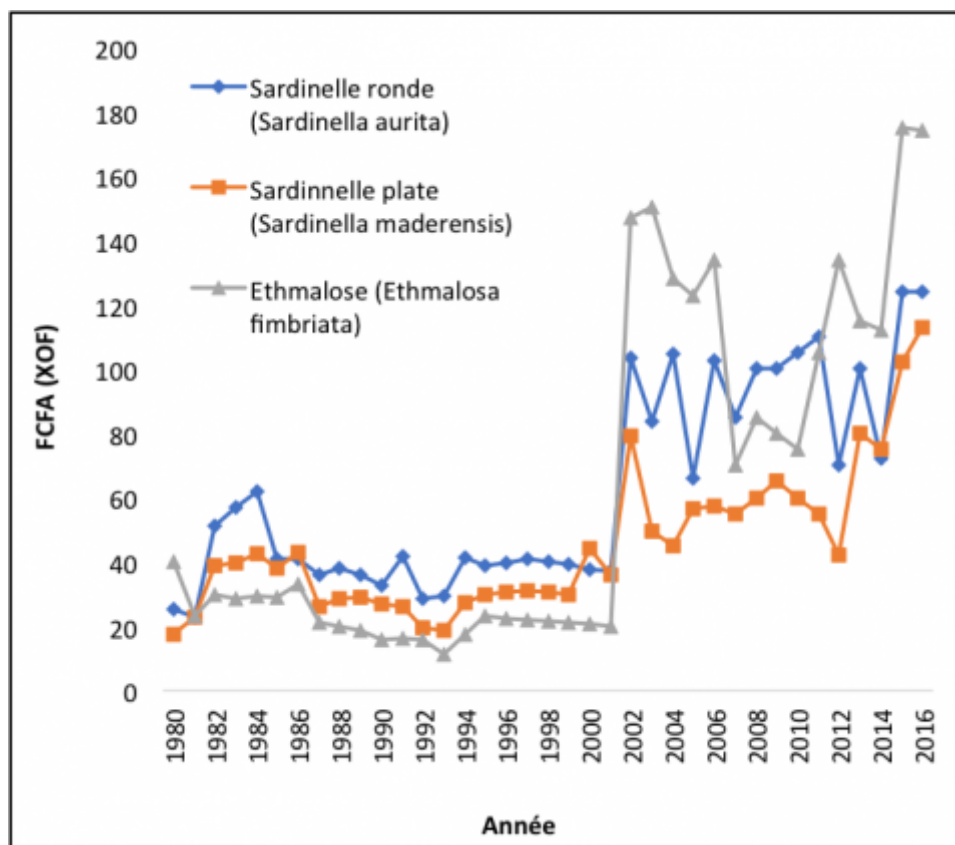


Source: Data taken from DPM annual statistical reports

Rise in the price of small pelagics on the Senegalese market

- 20 Au Sénégal, les prix⁷ du poisson pélagique au kilogramme ont connu une flambée sur la période 1980 - 2016. La figure suivante fait ressortir un prix moyen de 25 FCFA (XOF) au kilogramme sur la période 1980 jusqu'aux années 2000 pour la sardinelle plate, ronde et l'ethmalose. Depuis lors, le kilogramme des trois espèces se vend en moyenne à plus de 150 FCFA (XOF).

Figure 6 : Prix au kilogramme des espèces de petits pélagiques transformés artisanalement au Sénégal de 1980 à 2016



Source : Compilation des rapports statistiques annuels de la DPM (1980 – 2016)

Between 2015 and 2016, the price of bonga reached the price of 175 FCFA (XOF) per kilogram. It also emerged from the field surveys that during periods of low production, the kilogram of sardinella oscillates around 300 FCFA (XOF) per kilogram.

Difficulties of access to intermediate consumption products: fuel

- 21 It emerges from the fieldwork that the actors of artisanal processing in Senegal use a varied range of intermediate consumption products, namely fuel, salt and product packaging. The discussion here focused on the fuel which constitutes a heavy load for the small-scale processing segment. Various fuels are used for braising and smoking fish. Most of the fuel is taken from the forest.

Table: Type of wood used as fuel for artisanal processing, supply process and average consumption per operation

type of wood		Supply	Average consumption per operation
Hardwood	Green wood	Supplier purchase	Between 90 and 150 kilograms per operation and depending on the type of furnace ¹ and the quantity produced
	Dead wood	Supplier Purchase and Pickup	
Mangrove wood		Supplier Purchase and Pickup	
Straw		Supplier purchase	
Cardboard		Supplier Purchase and	

	Pickup
Charcoal	Supplier purchase
stem of millet	Supplier purchase
baobab bark	Supplier purchase

¹ The amount of fuel used varies according to the capacity of the furnaces. Thus at least women processors consume 90 kilograms of fuel per operation and 150 kilograms at most. The classic cinder block with an operating capacity of 1415 kilograms of fish consumes 150 kilograms of wood. The improved breeze block with a capacity of 540 kilos of small pelagics consumes 90 kilos of wood.

- 22 Over 60% of female processors interviewed prefer straw as fuel for fish processing. Hardwood is used less and less. Cardboard, millet stem and baobab bark are only used as back-up wood in the absence of hardwood and straw. Charcoal is very little favored by women processors because of its high price and the quality that is often lacking. Despite the diversity of fuels, women processors raised three barriers that make access to them difficult. First the restrictions put in place by the State to reduce logging and deforestation, then the marine protected areas erected on the Senegalese coast with a formal ban on logging activity, finally, the Casamance conflict in recent years and illegal logging on the Senegalese and Gambian border. As a result, access to fuels, especially wood, is increasingly difficult for all these reasons. The collection of dead wood is insufficient to meet the needs of a braising or smoking operation. According to women processors, suppliers are taking advantage of this situation of scarcity to raise prices. Thus, for a braising or smoking operation, the fuel charge went from less than 12,000 FCFA The collection of dead wood is insufficient to meet the needs of a braising or smoking operation. According to women processors, suppliers are taking advantage of this situation of scarcity to raise prices. Thus, for a braising or smoking operation, the fuel charge went from less than 12,000 FCFA The collection of dead wood is insufficient to meet the needs of a braising or smoking operation. According to women processors, suppliers are taking advantage of this situation of scarcity to raise prices. Thus, for a braising or smoking operation, the fuel charge went from less than 12,000 FCFA(XOF) to more than 32,000 FCFA (XOF) currently.

Discussion

- 23 In Senegal, the fishing industry is generally perceived as an activity exclusively dominated by men. This is true for capture activities, but in downstream activities, the role of women is indisputable (Durand, 1981a). They essentially ensure the artisanal processing and marketing of artisanal fishing products (Bennett, 2005). At least more than 80% of catches are marketed by women. However, they receive very little support and work in difficult conditions with the absence of infrastructure, a substantial financial base and social protection. They are more present in the small-scale processing segment. A segment currently compromised by several factors, including the unavailability of raw materials,
- 24 Field surveys and analysis of national data on fisheries in Senegal have shown that the availability of raw material, namely pelagic fish, is the main problem for women processors. The production of fish products has grown significantly in recent years. Between 2008 and 2018, it went from 426,000 to 527,000 tons. However, the observation is that this growth in national fish production has not benefited the artisanal processing market.
- 25 External demand has greatly influenced Senegalese fisheries. The quantities of fish exported are far greater than the quantities available on the local market (in 2018, 294,000 tonnes exported compared to 225,000 tonnes supplied on the local market).

Thus, over more than ten years (2008 - 2019), the supply of the local market has only changed slightly, exports have, on the other hand, increased significantly and have been multiplied by four.

26 Depending exclusively on the supply of the local market, the artisanal processing segment is the last link to be supplied. In the opinion of the fishermen, this situation is linked to the fact that the (fresh) wholesalers, and the freezing and fishmeal factories have a larger financial base and are more competitive than the women processors. As a result, the artisanal processing segment is facing a significant drop in the quantities supplied. Over a decade, their supply has dropped by 24,000 tons.

27 To this situation, it should be added that the overcapacity prevailing in the fisheries and the overexploitation of resources that resulted from it hinder the development of artisanal fish smoking. Post-catch losses reach 20% of the volumes caught in certain landlocked fishing centers (Hall et al., 2000). This means less production for artisanal fish processing. In addition, the demand for small pelagics being greater than the supply, this has influenced prices. The average price rose from 25 FCFA (XOF) per kilogram over the period 1980 - 2000 for flat and round sardinella and bonga, to more than 150 FCFA the average over the last two decades.

28 Beyond this problem of access to raw materials, women processors are also faced with the high cost of intermediate consumer products. It is established with the actors on the ground of the increase in the prices of fuels, salt and packaging necessary for the activity. The most illustrative example to demonstrate the rise in the prices of intermediate products is the case of fuels. Women processors most often use hardwood as fuel. Information collected in the field shows that the price of wood for a smoking and/or braising operation has almost tripled in 10 years. Thus, it went from 12,000 FCFA (XOF) per operation to more than 32,000 FCFA (XOF) currently.⁸in the face of deforestation (Solly, Dieye, Mballo, et al., 2020; BARRY et al., 2019; Solly, Dieye, Sy, et al., 2020). It emerged from information in the field that for each operation of braising or smoking fish, women processors use between 100 and 170 kilograms of fuel. In this context of restrictions on wood, this form of demand is difficult to meet. Thus, it emerged from discussions with women processors that sellers increase the price of wood, especially during the rainy season (June to October) when wood is scarce on the market. This situation also compromises the profitability of processing activities, especially since few alternatives to wood in sufficient quantities are currently available. Especially since the marine protected areas erected since 2004 in Senegal cover a large area of wood in their terrestrial and marine part (mangrove wood) which was used to feed the women processors (Beuret & Cadoret, 2021; Deme, Failler, et al., 2021; Failler et al., 2019). Currently, only the collection of dead wood is authorized with an insignificant quantity often only being used to cover domestic needs (firewood). These are all factors that make access to wood as fuel for braising and smoking fish increasingly difficult. Currently, only the collection of dead wood is authorized with an insignificant quantity often only being used to cover domestic needs (firewood). These are all factors that make access to wood as fuel for braising and smoking fish increasingly difficult. Currently, only the collection of dead wood is authorized with an insignificant quantity often only being used to cover domestic needs (firewood). These are all factors that make access to wood as fuel for braising and smoking fish increasingly difficult.

29 Beyond the problems raised above, the activity of artisanal processing shows that policies for the empowerment of women in Senegal are struggling to emerge. Indeed, unlike the production segment which is supported by the state through various subsidies ⁹(E. hadj B. Dème & Failler, 2022), women processors receive virtually no support from the state. Thus, their activity is part of the fabric of the informal economy which exposes them to great vulnerability with the lack of social protection and access to credit (Deme, Brehmer, et al., 2021). The dangerousness of the artisanal processing activity makes them even more vulnerable. The observation on the ground is that women processors are permanently exposed to smoke, pollution and the sun. In addition, the working environment of the artisanal processing segment is unsanitary

with sewage, fish entrails and other garbage littering the ground. No modernization policy for processing areas has been noted in recent years. Moreover, the lack of internal structural organization does not allow women processors to defend their interests or develop national initiatives. At the national level, there are a multitude of associations of women processors in the various processing sites, without any real consultation. The consequence is a weakness in the scope of the actions of the associations, a limited partnership dynamic and organizational fragility. Often even logics of competition are maintained between the different associations. The development of a strong national organization would have been a good lever for group purchases and sales, set prices or finance to have their fishing unit and establish vertical integration from production to processing and marketing. This would also have made it possible to have significant negotiating weight with decision-makers in order to have community areas fitted out and equipped (drying racks, handling bins, scales, smoking ovens, sheds-shelters, storage warehouses). These infrastructures would allow the processors to work in all seasons and protect the products from bad weather, absorption of humidity from the air and attack by insects. scales, smoking ovens, sheds-shelters, storage warehouses). These infrastructures would allow the processors to work in all seasons and protect the products from bad weather, absorption of humidity from the air and attack by insects. scales, smoking ovens, sheds-shelters, storage warehouses). These infrastructures would allow the processors to work in all seasons and protect the products from bad weather, absorption of humidity from the air and attack by insects.

30 The reform of the small-scale processing segment must be a priority for public decision-makers in this difficult context of scarcity and rising selling prices of raw materials, particularly pelagic fish, and the difficulty of accessing fuels. These are all factors that mean that the activity is less and less profitable and that the sustainable livelihoods of women are seriously threatened. Food security is also threatened in view of the social importance of this segment with products accessible to the poorest.

Conclusion

31 In axis 2 of the Emerging Senegal Plan (PSE) “Human Capital, Social Protection and Sustainable Development”, the State of Senegal is committed to policies for the economic empowerment of women in Senegal. As a follow-up, the Emergency Community Development Program (PUDC) was set up to support women in rural areas, especially to have infrastructure and socio-economic equipment to contribute to the sustainable improvement of their living conditions. life. Taking the example of the artisanal processing segment, a female activity, these policies seem to have no effect on the ground. It emerges from this study that the working conditions of actors in the artisanal processing of fishery products are still difficult. The availability of the raw material, namely the small pelagics has considerably reduced. Access to small pelagics will be increasingly difficult due to the low financial base of women processors, faced with solvent and more profitable markets (fresh market, processing into flour and export of frozen products). Thus, women processors are the last in the chain to get supplies. This justifies the fact that supply volumes have fallen by 20% over the period 2009 - 2018. In addition to the raw material, access to wood essential for smoking and braising wood is also compromised due to restrictions linked to the exploitation of wood as fuel, coastal pastoral charges and the context of restoration of degraded areas. For all these reasons, the volumes of small pelagics processed are quantitatively low and so are the economic returns. This situation exposes women processors to great vulnerability. It increases the poverty of the populations of the Senegalese coast if we know that a good part of the income of women processors contributes significantly to family expenses and the schooling of children.

32 In order to revitalize the artisanal processing segment, it is necessary to develop measures to supply pelagic fish to women processors and in sufficient quantity. New technologies must be developed to reduce the fuel loads of braising and smoking ovens for small pelagics. In addition, it is necessary to modernize artisanal processing areas to improve the working conditions of women processors, reduce post-processing losses and have better quality finished products for new markets. Thus, training actions on good practices (quality and hygiene) must be undertaken in the processing areas. By doing so, thousands of jobs will be saved,

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Ratings

¹Pelagic fish are species that live in the open sea, close to the surface and are essentially planktophagous. The main species of pelagic fish. The main species of small pelagics fished in the North-West African region are composed of clupeids, carangids, a scombridae and an engraulid (Ould Sidi, 2005; FAO, 2011). The clupeids consist of round sardinella (*Sardinella aurita*), flat

sardinella (*Sardinella maderensis*), sardine (*Sardina pilchardus*) and bonga (*Ethmalosa fimbriata*). The carangids are the black horse mackerel (*Trachurus trachurus* and *Trachurus trecae*) as well as the yellow horse mackerel (*Caranx rhonchus*). The scombridé and the engraulidé correspond respectively to the mackerel (*Scomber japonicus*) and to the anchovy (*Engraulis encrasicolus*).

2 Consumption per individual represents the apparent availability of small pelagic fish divided to the total population. Apparent availability represents production plus imports minus exports.

3 The new Letter of Sectoral Policy for the Development of Fisheries and Aquaculture (LPSDPA) which covers the period 2016 – 2023 mentions the need to promote fishery products and co-products by improving processing processes and modernizing processing areas by installing modern units. (Page 8 – Sector policy letter for the development of fisheries and aquaculture – LPSDPA 2016 – 2023).

4 Nearly 15% of the Senegalese population, or 600,000 individuals, are active in fishing. It contributes 11% of primary GDP and 3.2% of total GDP. It generates a global average annual turnover of 278 billion (M. Dème & Thiao, 2021; Ba et al., 2019).

5 Artisanal fishing is practiced by several fishing communities using more than twenty fishing techniques. The Senegalese artisanal fleet, exclusive to national fishermen, is 12,400 canoes in 2018 motorized up to 79%. Semi-industrial fishing is limited to the only sardine component limited in 2018 to 5 units. The national industrial trawl fleet is 104 vessels in 2018 against 15 vessels for the tuna fleet. In 2018, foreign industrial fishing consisted of 3 hake trawlers and 16 tuna boats (DPM statistical bulletins, 2018).



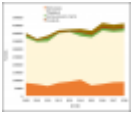
61- What observation do you have of the situation of artisanal fishing in Senegal? 2. What are your main sources of raw material supply (pelagic fish)? 3. How do you assess the quantities of fish received over the past five years? rise ? decrease ? 4. What are your intermediate consumption products? 5. What are the supply circuits for intermediate consumption, mainly fuel? 6. How do you assess the fuel supply circuit over the past five years? 7. What is your assessment of the activity of artisanal processing? Is it profitable? 8. How do you assess the working conditions in the artisanal processing sector? 9. Do you benefit from support from the State, technical and financial partners? 10.



7 Given the significant fluctuation in the prices of small pelagic species depending on the seasonality of the production activity and landings, the prices of the different species per year were obtained by averaging the monthly prices for each species) from the DPM annual reports.

8 Restrictions related to the ecological effects of timber extraction in Senegal.

9 Tax exemption on fuel, subsidies on the purchase of fishing materials (Deme et al., 2019, 2020).

Table of illustrations

	Title	Figure 1: the Senegalese coast and the geographical distribution of the main pelagic fish species exploited by Senegalese artisanal maritime fisheries
	Credits	Source: (Dème et al., 2022)
	URLs	http://journals.openedition.org/espacepolitique/docannexe/image/11049/img-1.png
	File	image/png, 577k
	Title	Figure 2: Maritime regions covered, landing sites and artisanal processing areas surveyed
	URLs	http://journals.openedition.org/espacepolitique/docannexe/image/11049/img-2.png
	File	image/png, 603k
	Title	Figure 3: Map of actors interviewed on the various landing sites hosting artisanal processing areas
	URLs	http://journals.openedition.org/espacepolitique/docannexe/image/11049/img-3.jpg
	File	image/jpeg, 38k
	Title	Figure 4: Evolution of annual landings for all species (2009 - 2018) in Senegal
	Credits	Source: Authors, 2022
	URLs	http://journals.openedition.org/espacepolitique/docannexe/image/11049/img-4.png

	File	image/png, 57k
	Title	Figure 5: Evolution of the supply of the artisanal processing segment from 2009 to 2019 (tonnes)
	Credits	Source: Data taken from DPM annual statistical reports
	URLs	http://journals.openedition.org/espacepolitique/docannexe/image/11049/img-5.png
	File	image/png, 34k
	Title	Figure 6: Price per kilogram of artisanally processed small pelagic species in Senegal from 1980 to 2016
	Credits	Source: Compilation of DPM annual statistical reports (1980 – 2016)
	URLs	http://journals.openedition.org/espacepolitique/docannexe/image/11049/img-6.png
	File	image/png, 81k

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