

Export logistics in Morocco. Characterization test of maritime and road transport market of agri-food exports of Southern Morocco.

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Abstract:

The gradual valuation of the various economic potentialities of southern Morocco has long made this zone an export basin of agri-food products. The port of Agadir is set up to ensure the maritime transport of these exports to foreign markets, mainly European.

Since the nineties, significant changes have occurred in the transport sector. The development of irrigation of early-vegetables in the zone and the development of a series of trade and TIR trucks traffic agreements between Morocco and the European Union countries, are among the factors that have favored the activity of international road transport. Refrigerated trucks offered transportation services for perishable goods from the warehouses to the large European distribution surfaces with a lot of flexibility.

Currently, with the adoption of the mode of conditioning by container under cold conditions, the maritime transport is regaining the confidence of exporters in the region, and that of specialized world shipowners who are settling down with strength at the port of Agadir.

Keywords: agri-food exports, maritime transport, road transport, containers, southern Morocco.

1- Introduction

Southern Morocco has always been a supply region of North provinces and European markets in agricultural and fishery products. The increasing the valuation of the various potentials of the area began to take shape with the Franco-Spanish colonization, but it became more concrete after the culmination of the Morocco's independence process by the return of the Saharan provinces to the motherland in 1975.

The successive development plans have voluntarily tried since independence to transform this territory of a conventional basin of out-migration to a modern export platform of agri-food products. In addition to economic structures inherited from the colonial era, ambitious projects have been made to support the intensification of agriculture and the fishing industry for export. Among the objectives set for these courses of action there has been the fight against poverty and rural exodus by supporting the employment offer in rural areas and the exports that generate the necessary foreign currency for the recovery of the foreign trade balance of the country.

In parallel with the development of economic production structures, the state has put in place adequate transport infrastructure for getting goods to foreign markets. Thus the port of Agadir has benefited from successive rearrangements to be a real port complex. Since 1988 a

new terminal has been set up at the port to separate the commercial activities from maritime fishing activities. The road network has received the same interest of the authorities; despite the accumulated delays in its development. The accumulated improvements were realized by the junction of Agadir to the national motorway network since 2010.

Originally, the flow of southern Morocco exports mainly consists of citrus and seafood was delivered almost exclusively by sea from the port of Agadir. But significant changes have occurred to change this situation in favor of road transport. In recent years Morocco has managed to get on one hand a series of trade agreements on agricultural products and fisheries and maritime traffic with the European Union countries, and on the other hand Souss-Massa zone has undergone a significant development of the agriculture of early-vegetables composed of foodstuff with a high level of perishability as tomato. Due to the opening of roads for truck traffic between Morocco and Europe, and to the inadequate polythermal ships to transport early-vegetables that require much care and flexibility, the transfer of agri-food exports of South Morocco by refrigerated truck has become an inevitable alternative, at least for the supply of European markets (El-Mahdad H. 2016).

Lately, with the innovations in maritime transport through the integration of refrigerated containers dedicated to the conditioning of agri-food products depending on their shelf life, and the adoption of the European Union of a policy of reducing the emission of greenhouse gases by the progressive reduction of traffic density, road and sea carriers have found themselves in a situation of a rather tough competition. The implementation of the European initiative "MEDA MoS" (MEDA Motorways of the Sea) has given a more intense dynamic to this confrontation.

In this article, it would be question to characterize the transport of agri-food products from a traditional export basin represented by southern Morocco, toward foreign markets that remain accessible by different modes of transport. If the air traffic still cannot get a notable share of this transport market, it appears that the boat is confronting the truck that still monopolizes a large part of the early-vegetables exports transported to the European Union markets.

2. Research Methodology and information sources

In the current state of the organization of export sectors and of those of international transport modes in Morocco, it would be difficult to measure the flows of the outgoing exports of southern Morocco or to accurately allocate them according to the mode of transport used. The products to be exported are highly varied so to have products of different types within the same sector or sub-sector. The case of early-vegetables and seafood is very significant in this context; the differences in degrees of perishability and sensitivity of products which impose strict requirements on their conditioning along the transport path. Also, participants in the export transport chain are multiple and are characterized by a strong segmentation. Consequently, the available and accessible data on the volumes and types of exported products are disordered and very scattered.

The existing bases of statistical data on exports transport modes, is characterized by a quite deep asymmetry between maritime and road transport. When the exports maritime traffic is processed exclusively by Marsa-Maroc, the only docks handler of the port of Agadir at the moment of conducting this research, the road traffic is forwarded by a multitude of national and foreign (International Road Transport) IRT companies of varying size (CETMO. 2010) whose records cannot be viewed thoroughly.

To rectify this situation of data deficiency among carriers that should be holders of first-hand statistics, the choice is made on the consultation of the Autonomous Establishment of Control and Coordination of Exports (EACCE) to overcome this deficiency. This organization is primarily responsible for ensuring the conformity of agri-food products to be exported with the standards required by the destination markets, including conditioning mode during the course of shipments.

Ultimately, the information gathered at Marsa-Maroc and EACCE were compiled into a single database to measure and analyze the flow of agri-food exports, over a period of five export campaigns from 2010 to 2014.

In addition to statistical data collected, this research is based on the consultation of a significant documentary production. The different available studies realized by administrations of guardianship often in partnership with international organizations, were an invaluable source of

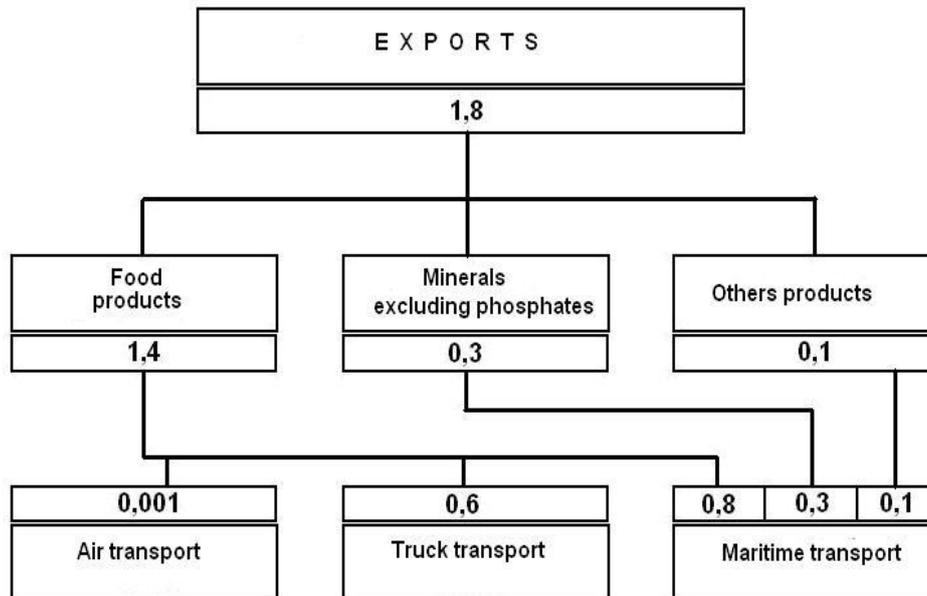
information (El Khayat M. 2004, MET-BM.2006, MATEE. 2007, MEF. 2008, World Bank. 2009, METL. 2013). Also of great interest is given to qualitative information and to valuable ideas collected through interviews and focus groups conducted with different actors and participants at different levels of the supply transport chain of the region exports (El-Mahdad H. 2016).

3 Results and Discussion

3-1 State of the total traffic of southern Morocco exports

Data compilation of the last five years (2010-2014) collected through documents and statistical tables of the EACCE and of Marsa-Maroc, shows that the average annual flow volume of outgoing exports of southern Morocco is in the order of approximately 1.8 million tonnes. In value this volume is equivalent to MAD 26 billion and covers approximately 17% of the total revenue of national exports (OC. 2012).

Figure 1. Distribution of the main southern Morocco export flows according to the modes of transport. (Annual average of the period 2010-2014 in million tons)



Source: own elaboration based on the data from the EACCE and Marsa-Maroc.

Agri-food products represent more than 3/4 of this volume and minerals excluding phosphates cover the 1/5. The remaining,

5% of the total, consists of various products.

In terms of exports of transport modes, 2/3 of products transported by sea, the remaining 1/3 uses road transport. Air freight, previously quite developed from the Agadir airport currently polarizes only a small volume of export traffic in the area, that is to say an annual average of 760 tons covering live or high perishability products as shellfish or some fruits and vegetables (Figure 1).

Monitoring the evolution of exports and their modes of transport shows that the volume of exports of the area has experienced an average annual growth of 13% between 2010 and 2014, and that it is the seaway which much more took advantage of this increase with an annual growth rate of 17%. Road transport has experienced only a growth of less than 8%.

In figures, on a total increase of the average export volume of more than 160,000 tons / year during the aforementioned period, the Seaway has captured an average mass of 116,000 tons every year, that is to say 71% of the total weight of this increase.

This situation is different from that of the previous years when the two modes of transport shared equally in 2010 the export loading. In 2014, the Maritime has exceeded the road to capture 60% of the total volume of goods transported to the outside of the country. Such a development could be due to changes in the strategies of exporters, transporters and ship-owners.

The examination of the structure of transport modes by type of goods shows that there is a high specialization of road and air modes, despite the very small margin of the latter in the loading of the agri-food products. While the marine transport constitutes a flow way of products of different export sectors, obviously with very variable proportions: 65% for agri-food, 28% for ores and 7% for other products (scrap, equipment and machinery, packaging products).

3-2 The shelf life a key of the mode of transport

That are agricultural products or seafood, the duration of their shelf place is usually very short place them in the category of perishable goods. For reaching consumers in a state of acceptable quality, these products must be handled very carefully along the supply chain from harvesting to the sale point. The stage of transport knows repeated manipulations and handling that may cause advanced product quality deterioration.

Generally, the harvest of fruits and vegetables and the capture of fisheries resources are expressed by a break of their biological cycle, and therefore their drive towards a process of quality loss. The causes of the deterioration of the nutritional properties are many: physical deterioration usually due to dehydration, physiological aging that starts right after harvest or capture, the proliferation of insects and rodents deteriorates these foods and expose them to all kinds of affections, the chemical and enzymatic deterioration develops when the products are damaged or crushed under the impact, this causes adverse chemical reactions ... (Ife Fitz J. et al. 2003).

To meet the needs of spreading of the conservation over long periods outside the harvest seasons or catch, and also to meet the requirements of commercialization over long distances, it would be necessary to move to the products processing. The processing takes several forms according to the set strategies.

This processing may consist in a simple conditioning aiming to keep the freshness of a product such as tomato or white fish. In this case to delay dehydration and aging, these types of products are supported through a supply chain under controlled temperature in dry environments and away from drafts, from harvesting to the final consumer (Table 1).

In other cases, the processing may be more furthered in order to arrive at more elaborated products with a longer shelf life and less demanding delivery possibilities; it is the case of canned fish. Between fresh product and canned seafood, there are a range of products with varying shelf lives requiring specific handling conditions between different supply links. We quote in this context frozen fish, semi-preserved products, by-products...

Apart from the processing, to have a longer shelf life that can cover the route of the road transport to distant markets, agricultural producers, as an example, adopt strategies based on: the choice of product varieties that are less perishable, as *Elena* a variety of tomatoes, and the picking of fruit or vegetables in an early stage of maturity. The latter will reach its final stage when the product is presented on the shelves of destination markets.

Table 1. Shelf life of agri-food products and the recommended thermal conditioning.

Products	Shelf life (Nbr. Days)	Recommended Temperature (°C)	recommended Renewal of air (m3 / hour)	Acceptable amplitude of temperature (° C)
Vegetables :				
Eggplant	10 to 14	10 to 12,2	15	7,2 to 18,3
Broccolis	7 to 14	0 to 0,6	30	- 0,6 to 5
Cucumbers	10 to 14	10 to 12,7	15	7,2 to 15,6
Strawberries	5 to 10	0,6	15	-0,6 to 5
Green beans	10 to 14	3,3 to 4,4	30	2,2 to 5,5
Dry onions	30 to 270	0,6 to 1,1	30	-0,6 to 5
Green onions	21 to 28	0,6	30	-0,6 to 5
Peppers	21 to 35	8 to 7,2	15	5 to 12,8
Potatoes	150	7,2	15	2,2 to 10
Red tomato	10 to 14	10 to 12,8	15	10 to 18,3
Green tomato	14 to 21	12,8 to 15,5	15	10 to 18,3
Tomatoes-cherries	21	12,8	Closed	12,8 to 15,6
Fruits :				
Lemon	30 to 180	12,2 to 13,9	15	7,2 to 15,6
Clementine	14 to 21	4,4	45	3,3 to 7,2
Oranges	21 to 90	3,3 to 8,9	15	3,3 to 10
Tangerine	14 to 42	5 to 7,8	15	3,3 to 10
Grapefruit	28 to 42	14,4	15	8,9 to 15,6
Seafood :				
Crabs	120-360	-17,8	Closed	-17,8 to -9,4
Shrimps	120-360	-17,8	Closed	-17,8 to -9,9
Fishes fat	120-240	-17,8	Closed	-17,8 to -9,5
thin Fishes	240 to 300	-17,8	Closed	-17,8 to -9,6
Surimi	120-360	-26,1	Closed	-17,8 ou moins
Data Sources : www.cma-cgm.fr				

By examining southern Morocco exports, we notice that exports of fruits, vegetables and fresh fish on the one hand and frozen fish on the other hand require the

establishment of a temperature controlled chain to different modes of transport. Fresh products constitute 72% of total exports; the share intercepted by refrigerated trucks

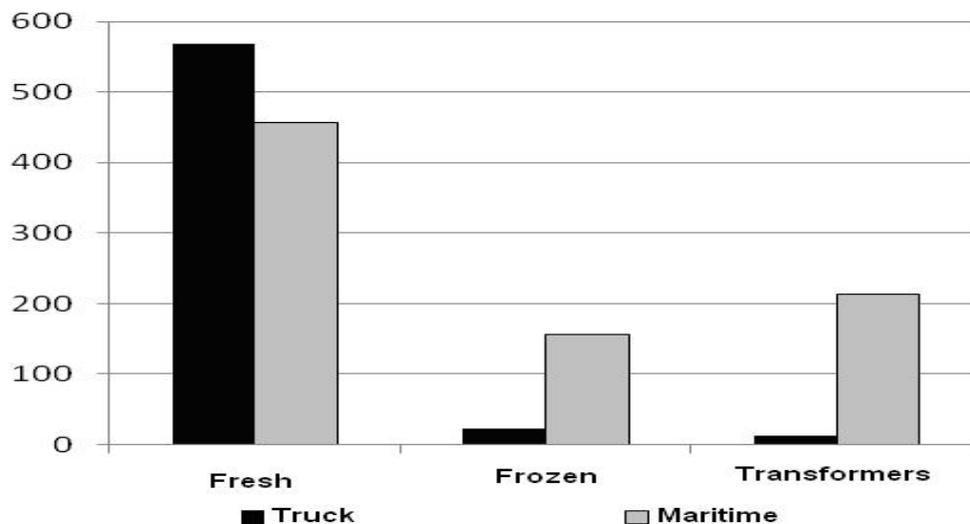
is around 55%. Obviously, it is the early-vegetables especially tomatoes which dominate widely in this flow. The remaining that is 28% of fresh products is composed of citrus.

However, frozen products formed mainly of fish, they constitute only 13% of the total agri-food exports, and 87% take the

maritime route to markets outside the European Union.

The processed seafood products constituted precisely of canned fish, fishmeal, fish oil and semi-preserved products form only 16% of the total exports. Seaway flows 94% of all of these products (Figure 2).

Figure 2. The nature of the exported products according to the level of processing
(Annual average of 2010-2014).



Data sources: Graphs developed from data analysis of EACCE.

3-3 Distance of markets and choice of transport modes

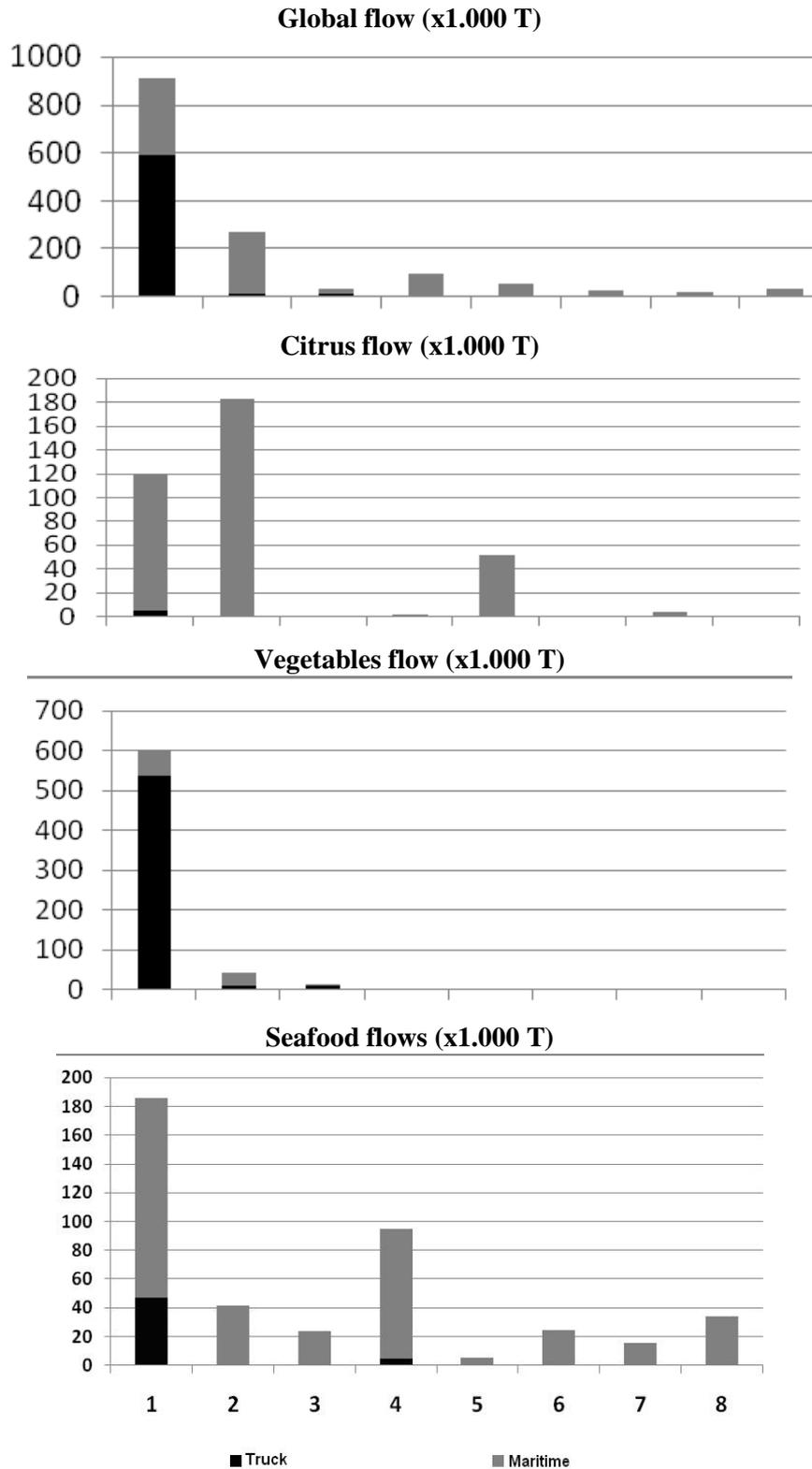
The overall flow of agri-food exports focuses mainly on Europe for 84% of the total. The European Union market alone attracts the 3/4 of exports flow towards this continent, more than 20% are captured by the countries of Central and Eastern Europe (CEE), and only 3% by country of Eastern Europe. In terms of the routing channels taken, maritime and road each treats half of all exports to the European continent (Figure 3).

The balance between these two modes of transportation is realized between citrus which almost exclusively use maritime transport at the rate of 98% of total citrus exports to Europe, and early-vegetables mainly transported by refrigerated trucks at a proportion of 85%. Exporters of seafood products make use of boats to sell 4/5 of their goods to Europe.

Distant markets outside European Union, receiving 16% of exported goods, are served mainly by sea:

- The countries of West Africa are the second market for citrus and seafood for these markets, a proportion of 6% of goods are marketed by road via the exit door "Guergarate". , Morocco-Mauritanian border post;
- America absorbs 6%, 4% for the countries of the North American Free

Figure 3. Modes of service to the markets of export according to the nature of the products (annual average of 2010-2014)



1-U-E, 2- PECO, 3- Eastern Europe, 4- Africa, 5- ALENA
 6- Latin America, 7- Middle East, 8- Asia and Oceania.
 Source: Graph developed from the data analysis of the EACCE.

Trade Agreement (NAFTA) mainly citrus and 2% for the Latin America importing mainly by-products of fish namely oil and Fishmeal;

- Asia and Oceania receive 2%, it is usually seafood in addition to a limited quota for early-vegetables which will not be sold easily to the countries of the Arabian Golf.

3-4 The boat and the truck, what relationship?

During the same reference period, generally a 56% proportion of exports from the zone were carried by sea, against 44% of these exports have taken the road (Table 2).

Table 2. Distribution of exported products by mode of transport.
(Calculated on the basis of the annual average of the exports 2010-2014)

Sector	Products	Export		Mode of transport			
				Road		Maritime	
		T	%	T	%	T	%
Citrus	Oranges	92 002	26	7 305	8	84 696	92
	Small citrus fruits	254 560	73	9 718	4	244 842	96
	other citrus fruits	3 438	1	602	18	2 836	82
	Total	350 000	100	17 625	5	332 375	95
Early-vegetables	Potato	18 790	3	7 027	37	11 763	63
	tomatoes	323 696	51	257 130	79	66 566	21
	Other vegetables	287 514	46	269 114	94	18 400	6
	Total	630 000	100	533 271	85	96 729	15
Seafood	Fresh fish	14 734	4	13 840	94	894	6
	Frozen fish	171 269	41	38 987	23	132 282	77
	By-products	6 888	2	6 333	92	556	8
	Semi-preserved	15 810	4	13 260	84	2 549	16
	Can of fish	103 025	25	6 659	6	96 366	94
	Fishmeal and fish oil	108 274	26	10 997	10	97 277	90
	Total	420 000	100	90 076	21	329 924	79
TOTAL		1 400 000		616 000	44	784 000	56

Sources of data: EACCE and Marsa-Maroc.

Depending on the nature of the goods, the truck driver is practically specializes in tomatoes and other vegetables. Having formed approximately 2/5 of all South Moroccan exports, 85% of these products have been transferred by refrigerated trucks. In second place come seafood in the form of fresh fish, frozen fish and semi-preserved, but with a quite small proportion, only 11% of the total volume of seafood is exported by road.

At the opposite, the marine transport mode does not show a strong concentration similar to road mode. The most important rate is presented by citrus, mainly small oranges covering about 1/3 of all the products transported by ship, followed by the frozen fish at a rate of 17%. Two other products are transported almost exclusively by ship, are canned fish and by-products represented by the fishmeal and fish oil.

Based on the cross-check of transport modes with the nature of the exported

goods, it is found that the choice of a transport mode by exporters is not a simple thing. Several factors along the supply chain interfere to reach the decision making, mainly the shelf life of agri-food products, the characteristics of the destination market, namely the route distance to go, the volume of commands expressed downstream of the supply chain, as well as the access rights to certain markets such as the case with some Moroccan products limited by quota thresholds to access to the European-Union market.

3-5 The reefer container an alternative for the substitution of the refrigerated truck

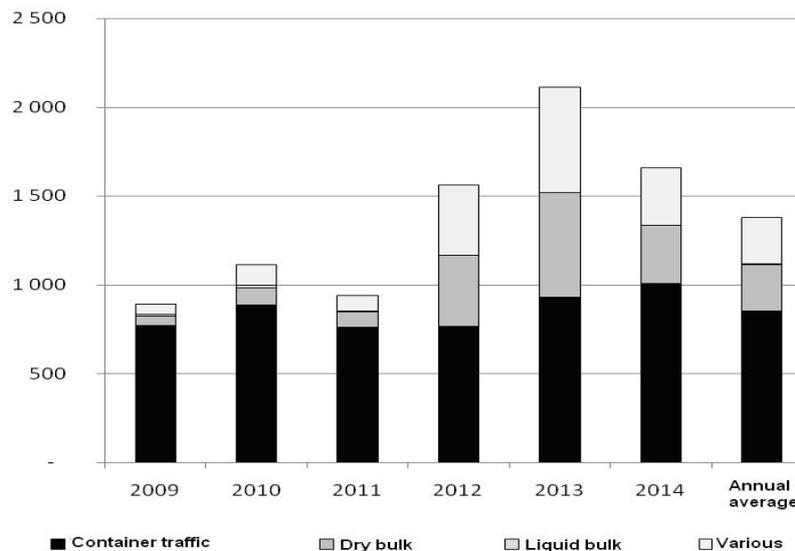
Aiming at the development of "motorways of the sea" as a competitive alternative multimodal, sustainable road transport and low freight costs between the ports and the Mediterranean markets, Meda-Mos program has reserved technical assistance for the port of Agadir to set up a regular shipping line to Port-Vendres. This project planned the capture of a volume of 0.6 million tons of exports of agricultural

products toward Europe initially transported by road (ANP and Marsa-Maroc).

In this coming back to maritime transport, the choice is made on the adoption of the mode of conditioning by reefer container that has the privilege both to overcome the constraints of polythermal ships and to acquire the plasticity of refrigerated trucks. After a pilot phase, the port of Agadir has succeeded to attract major world shipping companies as Maersk, MSC and CMA-CGM which have established regular shipping lines to connect this port to the new world network of shipping containers under cold conditions.

According to the actors of the port of Agadir, the container is attracting a growing share not only of road traffic but also polythermal cargos. It has just surpassed 1 million tons in 2014, while it was at 770,000 tons in 2009. Even the products that are conventionally treated in dry bulk as ores are in the process of migrating to this new type of conditioning that is represented by the container (Figure 4).

Figure 4. Evolution of exports handled at the port of Agadir by conditioning modes (1000 x T)



Data sources: Marsa-Maroc, Agadir.

It is certain that it is the benefits of the containers and its incessant innovations that have made this metal box a maritime

conditioning tool widely used. The characteristics of the container are sufficiently developed in the available list

of studies and researches on logistics and transport engineering (El-Mahdad H. 2016).

For the conditioning of products under cold conditions composed mainly of fruits and vegetables and of fish, the reefer container presents innovative advantages: it offers different temperature thresholds for preservation at fresh state, freezing at -20°C and deep-freezing until -40°C , possibility of follow-up and recording temperature in a continuous manner along the transport route from start to finish ... Some maritime companies are starting to offer services of remote monitoring and in real-time the temperature of goods during their circuit, and the commissioning of unconventional reefer container size 45 " (great pallet wide). This type of box is designed for potting 33 pallets, the equivalent to the capacity transported by refrigerated truck.

In addition to their size adapted to contain a few more pallets, these boxes allow to leave a gap between the pallets needed for the circulation of refrigerated air, as well as the implementation of airbags between pallets for the protection of goods susceptible to damage caused by the swaying ship.

Furthermore, to improve the container integration in the environment, reefer containers are increasingly made from sustainable products. The example of the bamboo used in the pallets bases instead of wood is often indicated by the maritime companies as an innovation.

Finally, it should be noted that the dry container does not lose its share in the flows exported from Agadir, there is still another more and more demanded means for the transport of non-perishable products. In addition to traditional products such as packaging products and processed seafood (canned, fishmeal ...), products usually transported in dry bulk are now migrating to dry containers, it is the case of some ores such as barite and cement.

The actors that are met believe that after the recent changes, the container terminal at the port of Agadir is forming one of the most important reefer port platforms in Africa and the Mediterranean basin.

Conclusion

Normally in an intermodal context, it is certain that there is a complementary relationship between the various vectors of goods transportation. In the case of the port of Agadir, we cannot imagine loading a ship without using trucks operating between warehouses of goods of Southern Morocco and the docks. Yet beyond this symbiotic relationship, the refrigerated truck has emerged as a serious competitor with high capacity of capture and direct routing of a significant part of the zone exports to the European Union markets.

In the current context, even if the international road transport is well developed in relation to the ongoing achievements in Morocco for the new reform of the sector and the improvement of the national road network, the recent actions of the requalification of the port system are now giving a better position of the sea transport.

To benefit from this trend, it becomes essential to find the necessary combinations for the implementation of the recommendations of various strategies and development plans, within a framework of intermodality and complementarity between the different modes of transport. The national port strategy, the national development strategy of logistics competitiveness, the Master Plan of Urban Planning of Greater Agadir and the Plan of urban transport in Greater Agadir plan numerous projects for a good organization of transport in the zone.

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