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## **EXPLORING HOUSEHOLD FOOD WASTE ISSUE IN ALGERIA**

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### **ABSTRACT**

Food losses and waste (FLW) is a phenomenon that has been underestimated, little studied and poorly documented in the Mediterranean countries. Actually, no policies, laws, strategies and action plans have been implemented to reduce FLW in Algeria. This exploratory study aims to evaluate household FW in Algeria. An online survey with 323 Algerian households was conducted in February-April 2015 to assess the knowledge and relative importance of FW; attitudes towards FW; impacts of behaviors regarding food and food management; FW quantity and value; as well as barriers and willingness to behavioral change. Sample is gender-balanced (54% female and 46% male) and rather young (93% are less than 44 years old) while most of respondents have high education level. Results show that household planning and shopping activities are significant forecasters of FW. Attitudes may change according to periods especially in Ramadan (88% of respondents declare that FW increase during this month) and to the category of food (most wasted product groups are fruits and vegetables, cereals and bakery products). Most of the respondents have a good understanding of “use by” food date label while they still confuse the meaning of “best before”. It seems that FW is widespread in Algeria as only 1% of respondents declare that they do not waste any food. About 15% declare that their households throw away at least 250 g of still consumable food each week. Even though Algeria is considered as a developing country, an important part of food wastage occurs at consumer level as in high and middle income countries. In order to reduce food waste, efforts should be directed towards providing consumers with skills and tools to deal with their food-related activities and to better consider the impact of food waste on the environment and economy.

**Keywords:** *food waste, online survey, household behavior, Algeria.*

## INTRODUCTION

Food losses and waste (FLW) issue has long been underestimated, little studied and poorly documented. Nevertheless, its reduction is nowadays considered as a key factor to improve the sustainability of the Mediterranean food system and achieve food and nutrition security in the region (UNEP/MAP, 2015). In the Mediterranean area, food systems are confronted to major sustainability challenges related to food consumption and production patterns (Lacirignola *et al.*, 2014; Capone *et al.*, 2014; CIHEAM and FAO, 2015). In fact, food insecurity and malnutrition are still present in some countries of the area. Population is steadily and rapidly increasing in the South as well as food demand all over the region. At the same time, agricultural production in the area has to deal with limited natural resources, principally in the South. Moreover, agriculture is the main water user in a region where water scarcity is the most critical development problem and a main factor limiting agricultural growth (CIHEAM, 2008).

Food losses and wastage occur in each step of the food chain; harvesting, transport, storage, packaging, processing, wholesale and retail trade, and where food is consumed (Institution of Mechanical Engineers-UK, 2013; Gustavsson *et al.*, 2011). FLW occur between the moment when a product is ready to be harvested or harvested and the moment when it is consumed or removed from the food supply chain (Parfitt *et al.*, 2010). Losses in the first part of the food chain, which are due to poor harvesting, transport, storage, are more important in developing and low income countries (Venkat, 2011; Lundqvist *et al.*, 2008), while in industrialized, high and middle income countries most food losses occur at the retail and consumer level (Gustavsson *et al.*, 2011). Food waste can be even classified as either avoidable or unavoidable. Avoidable food waste consists of products that could have been eaten, such as leftovers, food left to go bad and food that past its sell-by date. Unavoidable food waste consists of non-edible waste such as peels, bones, shells and coffee grounds (Schott *et al.*, 2013).

The report of the High Level Panel of Experts on Food Security and Nutrition (HLPE, 2014) has underlined that FLW are very dependent on food systems. Understanding differences among food systems can help identify critical areas as well as means for improvement. It stresses the need to improve knowledge on FLW for understanding their causes within the diversity of countries and food systems. That means that solutions have to be adapted to local situations. However, basic information is lacking on the types and quantities of food lost and/or wasted. Available data are scarce and fragmented.

The Economist Intelligence Unit (2015) released a report ranking Algeria 68<sup>th</sup> of 109 countries in terms of food security. Algeria is one of the biggest world wheat consumers while its national production covers only 25% of its needs. The same applies to the milk powder; 60% of milk needs are covered by imports. The import bill of food has quadrupled since 2000; it went from 2.6 billion US\$ in 2003 to more than 10 billion US\$ in 2013 (Si Youcef, 2013).

Unfortunately, the main institutions (ministries, agencies) justify this situation by causes related to low food production and lack of effective strategy to meet

people's food needs; no analysis has been developed regarding FLW by the Algerians and their questionable food habits.

To deal with food insecurity problem, the state implemented new policies; Renewal of Agricultural and Rural Economy and new legislation as the Agriculture Act Law No. 08-16 of August 3, 2008 (MADR, 2008), ignoring an obvious problem, discussed informally by all spheres of Algerian society, including the press and intellectuals, which is food waste in Algerian homes.

The Ministry of Commerce addresses this problem only at Ramadan eve, through a formal speech broadcast by the media to the public, but no campaigns or actions were launched to fight against waste nor during Ramadan neither during the rest of the year.

The actions of The National Union of Algerian Traders and Artisans (UNPC), the national consumer protection association, its local representations, ministries of agriculture, trade, health and all government and nongovernmental organizations related to the topic of food waste are limited to raising the awareness of consumers, producers and traders on the quality of food products on the market (e. g. storage, expiration date, packaging). Even these campaigns are launched at the beginning of each summer, because of the heat that characterizes the country during this season and which causes the loss of big quantities of food due to inappropriate cold chain management.

The government represented by the Ministry of Agriculture and the Ministry of Trade, focus on food quality and availability, dealing with FLW problem as a secondary issue. Actually, no policies, laws, strategies or action plans have been implemented since the independence of the country in 1962. The only actions are done by NGO's and even the latter are very limited.

During the last week of Ramadan (Friday July 10<sup>th</sup>, 2015), the National Consumer Protection Association (UNPC), in collaboration with many local associations and with financial support by a food company (CEVITAL) and the city of Algiers, organized for the first time a dinner called "*Chaabi-ftour*", which means "*popular fast breaking meal*", prepared only with foods (dishes, fruit, vegetables. . . ) that were not consumed by people. Leftovers were collected from households of Algiers. The action has as objective, food waste reduction during the holy month, but, unfortunately, such actions are not repeated out of Ramadan.

In Algeria the main foodstuffs such as cereals, milk, cooking oil, sugar, etc. – which are subsidized by the state - are available on the market at low prices. These prices accessible by almost all of the Algerians make waste of bread, milk, as well as all products prepared with these subsidized foods a marginal issue.

The present work aims to analyse household food waste in Algeria focusing in particular on: knowledge of and perceived relative importance of food waste; attitudes towards the environment, waste and food waste; impacts of behavior regarding food and food management on food wastage; quantity and value of food wasted; and barriers and willingness to behavioural change.

## MATERIALS AND METHODS

During the last years the Department of Sustainable Agriculture, Food and Rural Development of the International Centre for Advanced Mediterranean Agronomic Studies in Bari (CIHEAM-Bari) has undertaken different activities on the sustainability of the Mediterranean food system. In the framework of these activities, a particular attention was devoted to the issue of food waste in the Mediterranean region. In fact, precise and accurate data regarding FLW should be enhanced. In the final declaration of the 10<sup>th</sup> meeting of the CIHEAM member states' agriculture ministers - held in Algiers in February 2014 - the relevance of food waste issue in the Mediterranean countries was strongly stressed (CIHEAM, 2014).

The present paper was based on the results of an exploratory survey performed in Algeria using a questionnaire that was adapted to the Algerian context from previous questionnaires and studies on food waste carried out in Australia (OEH, 2011) and Italy (Last Minute Market, 2014).

The tool used to conduct the food waste survey is a self-administered questionnaire. It was designed and developed in English, French and Arabic languages in December 2014. The survey was performed from February 17<sup>th</sup> to April 4<sup>th</sup>, 2015, through the *Survio* website. About 1529 persons visited the survey site. Participation was entirely on a voluntary basis and responses were analysed only in aggregate.

The questionnaire consisted of 26 questions. It included a combination of one option and multiple-choice questions. It was developed into six sections:

- Food purchase behaviour and household food expenditure estimation: questions related to this section aimed to check behaviour and attitude of Algerians towards shopping.
- Knowledge of food labelling information: this section informed about different interpretations of food date labels by Algerian consumers.
- Attitudes towards food waste: the questions of this part highlighted different points of view regarding food waste at households.
- Extent of household food waste: this section interrogated participants about their awareness of food wastage.
- Economic value of household food waste: this part of the questionnaire evaluated economic value of food wastage
- Willingness and information needs to reduce food waste: the last section gave recommendations of how one can reduce food waste in Algerian households.

In the introductory part of the questionnaire, the concept of FLW was introduced to inform the respondents.

Various institutional communication channels were used to disseminate the questionnaire such as institutional websites (e. g. [www.uhbc.dz](http://www.uhbc.dz)), social media (e. g. Facebook, Twitter) and personal e-mails.

Data were analysed using descriptive statistics (e. g. means, max, min), in order to get a general picture of frequencies of variables, using Microsoft Excel.

Out of 339 questionnaires received, 16 were not considered because there were missing data. Therefore, the total number of the sample is 323 adult Algerians. Respondents were from 43 different cities covering the whole country. Fifty-four percent of respondents were females. As for age group, participants in the survey who are aged from 25 to 34 years accounted for 54. 5% of all interviewed individuals. About two thirds of respondents (67. 5%) have a high education level (masters, doctorates). Among all interviewed persons 46. 7% were employed full time/part time. The majority of respondents (65. 9%) live with their parents (Table 1).

Table 1. Profile of Respondents (n= 323).

Items		Percentage (%)
Gender	Male	45. 8
	Female	54. 2
Age	18-24	24. 4
	25-34	54. 5
	35-44	13. 9
	45-54	4. 3
	55 and over	2. 8
Family status	Single person household	4. 3
	Living with parents	65. 9
	Partnered	5. 6
	Married with children	20. 4
	Shared household, non-related	2. 2
	Other	1. 5
Level of education	Primary school	1. 2
	Secondary school	1. 5
	Technical qualification	2. 2
	University degree	25. 7
	Higher degree (MSc, PhD)	67. 5
	No formal schooling	1. 8
Household composition (number of members)	1 to 3	16. 7
	4 to 6	53. 6
	7 to 10	26. 3
	> 10	3. 4
Occupation	In paid work (fulltime or part-time)	46. 7
	Student	36. 5
	Unemployed and looking for work	13. 3
	Home duties	2. 2
	Retired/Age pensioner	1. 2

\*Source: Authors' elaboration based on survey results.

## RESULTS AND DISCUSSION

According to answers of respondents, only 12.5% buy their foods from hyper/super markets. However, the majority (56%) buy food from mini-markets, and shops (bakers, butchers, grocers...), while those who buy weekly or daily from markets represent 30%, the direct purchase from farms is rare. The low rate of people purchasing their foods from hyper/super markets is due to the low number of this kind of markets in Algeria, except in big cities. Small shops are still dominant in rural areas and small villages.

According to the survey, 39% of respondents do their food shopping every day, 15% every two days, while those who buy their food once or twice per week represent 19% each, the surveyed persons who buy their food two times per month or monthly represent only 3 and 4%, respectively.

The survey revealed that 30% of participants spend between 15,000 and 20,000 Algerian dinar (1 AD = 0.0092 Euro), while the rate of those whose food costs between 10,000 and 15,000 AD as well as between 5,000 and 10,000 AD per month represents 27%. Thirty percent of respondents revealed that they spend more than 20,000 AD monthly. This means that many Algerians spend all or half of their payroll in food because SNMG (average national guaranteed wage) in Algeria is 18,000 AD, whereas our neighbours (Moroccan) spend about the half (900 MAD) (1 MAD = 0.1 Euro) and Egyptians respondents spend about 37% of their income on food (Abouabdillah *et al.*, 2015; Elmenofi *et al.*, 2015).

The rate of respondents who use a list when shopping and people who do not use list is the same (30%), while 40% sometimes use a shopping list. The use of the shopping list is especially frequent in case of monthly shopping.

About two fifths of respondents (37%) said that the deals (*e. g.* buy one get one free, etc.) do not attract them and only 24% are interested in special offers, while 38% said that the offers are sometimes attractive. Actually, these kinds of offers are common in the hyper/super markets; however, their number in Algeria is still limited.

Consumers' poor understanding of "use by" and "best before" date labels may encourage food waste at home. This behaviour is made largely by the confusing system that some countries adopted for the expiration date of the products. Many studies have called the attention to inconsistencies that exist in the labelling of products, which cause many products to be discarded for this reason. In the United States (USA), federal law requires the manufacturers of processed products to use three different dates on the packaging: "sell-by" or "best if used by" and "use-by" being the first the deadline for the product to remain on the supermarket shelf, the second the best date for consumption and the third the deadline from the point of view of food safety. In Europe there are two types of legally required date marks (Directive 2000/13/EC) addressed to consumers: "best-before", which relates to food quality and indicates the "*date until which the foodstuff retains its specific properties when properly stored*" and "use-by" which relates to food safety, for "*foodstuffs which, from the microbiological point of view, are highly perishable and are therefore likely after a short period to constitute an immediate danger to*

*human health*". The European Commission wants to help consumers reducing food waste by making "best before" and "use by" dates clearer on the packaging (HLPE, 2014).

Various studies in the USA (NRDC, 2013), Europe (Bio Intelligence Service, 2010), the United Kingdom (WRAP, 2011) and Spain (HISPACOOP, 2012) have underlined that food date labelling, and confusion about it, are a major indirect cause of FLW at retail and consumer levels, as consumers tend to assume that dates are linked to food safety when they are in reality more often grounded on food quality. Date labelling is also a major cause of FLW and of economic loss at retail level as retailers often anticipate dates to preserve their good image (MAGRAMA, 2013; NRDC, 2013).

The survey participants were asked about their knowledge regarding the date label "use by". Eighty percent think that this statement indicates to consume or throw food before this date, while 15% understand it as food products are still fit for consumption after that date, if they are not damaged, spoiled or deteriorated, and only 4% believe that food should be sold at a discount after that date.

Regarding the "best before" date label, 70% of the respondents still have confusion as they think it means that food must be consumed before or discarded after that date. About 26% said that this label means that food is still suitable for consumption after the date if it is not spoiled or damaged, and only 4% see that food must be sold at a discount after that date. Abdouabdillah *et al.* (2015) found that 65% of Moroccan respondents confuse between the two labels.

About the question of the awareness of food waste problem, 86% of interviewed persons admit they worry and try to avoid when they can. Only 5% answered that they are aware of the problems associated with food waste, but they do not think that their behaviour will change in the near future, and 5% do not consider food waste as a crucial problem. Just 3% confirms that they had an interest in the issue of food waste in the past, but now they do not care about it. Most of people interviewed showed a high level of awareness about the issue, which is an important condition for a future behaviour change.

The survey provided some interesting information about the amounts of uneaten food wasted. Interestingly, 47% of respondents declare that they are wasting a very small amount of food, and 29% say they waste a reasonable amount, but 4% admit they are throwing away much more than they should, while 6% argue that this issue has a greater importance than it should. Unfortunately, only 1% of respondents said that they waste no food in their homes. Even if food waste is obvious for all survey's participants, a wide percentage said that they throw away a very small or a reasonable amount of food; on the contrary, just few of the interviewed persons confirm wasting big quantities.

The participants were asked about the final use of uneaten food; 46% confirmed that it ends up in the trash, while 47% said that the remaining food is given to animals. About 13% donate it to the needy people and 6% transform it into compost (Fig. 1). The final use of uneaten food is similar in Egypt and Morocco;

uneaten food that ends up in the garbage is 34. 8% in Egypt (Elmenofi *et al.*,2015) and, unfortunately, 69% in Morocco (Abouabdillah *et al.*,2015).

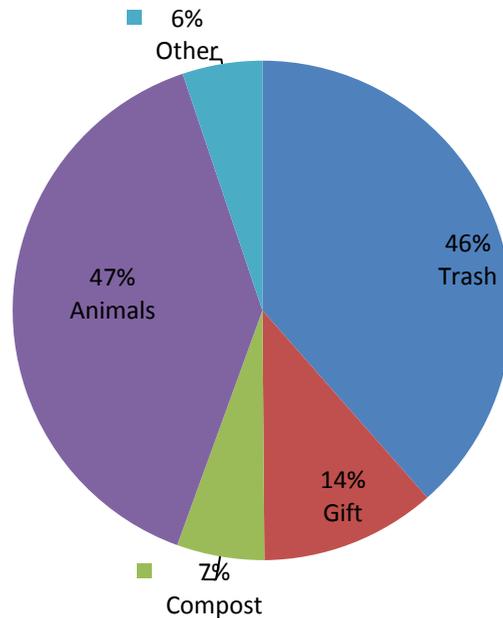


Figure 1. Final use of wasted food.

\*Source: Authors' elaboration based on survey results.

The survey revealed that 10% of participants throw leftovers more than twice a week, about 46% do it less than once per week, and 21% discards leftovers once to two times per week, while 23% said that they never throw leftovers. Almost a quarter (24. 5%) of the interviewed people prepare their main meal with fresh raw materials, while those consuming the remaining meals of the previous day less than 3 to 6 times a week represent 30% and about a half (52%) of respondents consume leftovers less than twice a week.

The survey showed that Algerians prefer to eat at home as only 15% of respondents eat outside 7 to 10 times a week, while 35% never eat out-of-home. For prepared or frozen meals, 80% say that they have never bought them; only 12% consume them twice a week. The survey shows that Algerians prefer to have lunches and dinners at home. Prepared dishes and frozen foods are not widely eaten.

Regarding the month of Ramadan, people were asked about the relative extent of food wastage noticed during the holy month for Muslims with respect to other months; 88% admit that food waste significantly increases and reaches its peak, even though many weeks before the holy month the government and NGO's launch several campaigns to fight against this negative phenomenon. There are some similarities in this regard also with Morocco and Egypt. In fact, 87% of Moroccan and 75. 7% of Egyptian respondents confirm this negative phenomenon (Abouabdillah *et al.*, 2015; Elmenofi *et al.*, 2015).

According to participants' opinions, the main reason that contributes to the wastage of food at homes is that usually foods are left in the fridge for a long time (58%), while 47% say that leftovers are thrown. Moreover, expiration date is another reason listed by 35% of respondents. Surprisingly, 39% of respondents believe that organoleptic and food quality are the causes, because some foods do not have a good smell or taste.

A half of the interviewed persons confirmed that they never throw away still consumable food, however, 21% of surveyed people say they throw less than 250 g per week, while 13% throws between 250 g and 500 g. Those that throw away larger quantities are a minority; only 2% of respondents wastes more than 2kg of food per week.

As expected, cereals and bakery products are the most wasted products; according to the survey 22.9% of respondents declared that they waste more than 20% of purchased cereals and bakery products. Also wastage of vegetables and dairy products is significant in Algerian households (Fig. 2).

Table 2. Percentage of food groups wasted (n= 323).

Items	Less than 2%	3 to 5%	6 to 10%	11 to 20%	Over 20%	Total (%)
Cereals and Bakery products	38.8	14.2	13.3	10.8	22.9	100
Roots and tubers	60	20.8	8.3	4.6	6.3	100
Pulses and oilseeds	68.3	15	7.9	5.4	3.3	100
Fruits	77.1	8.8	6.3	5.4	2.5	100
Vegetables	59.2	19.6	11.7	4.6	5	100
Meat and meat products	83.3	6.7	5.8	2.5	1.7	100
Fish and seafood	85.4	8.8	3.8	1.3	0.8	100
Milk and dairy products	63.8	17.5	9.2	4.6	5	100

\*Source: Authors' elaboration based on survey results.

The survey showed that only 52% of respondents waste the equivalent of 400 AD (about 5 US\$) per month in terms of food, while 40% wastes between 500 and 1500 AD (6 to 20 US\$) monthly. Those whose economic value of household food

wasted exceeds 4000 AD (51 US \$) are only 5% (Fig. 2). According to the survey done in Egypt, 78. 5% of Egyptian respondents admit that the economic value of the monthly wasted food is less than 35 Egyptian pounds - EGP (5US\$) and 14. 9% of respondent revealed that the economic value of wasted food is between 42 and 140 EGP (6 to 20US\$) (Elmenofi *et al.*, 2015).

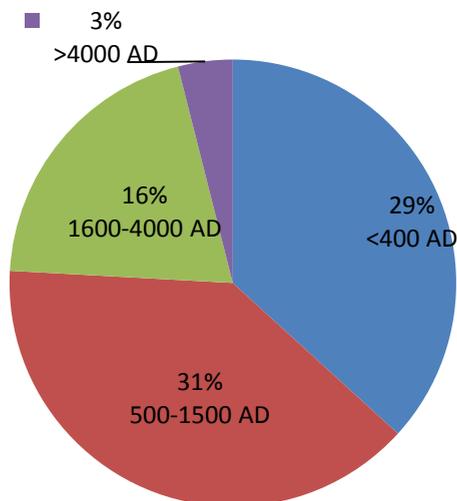


Figure 2. Economic value of food wasted by Algerian households.

\*Source: Authors' elaboration based on survey results.

Respondents were asked about what they wished it exist to avoid waste. About 45% say they would throw less food if they were better informed about the negative impacts of food waste on the economy; while 44% thought that they are misinformed about the negative impacts of food waste on the environment; and 35% believe that additional taxes against the wasters could reduce food waste.

Finally, respondents were asked about information they need to reduce food waste. More than the half say they need tips on how to store food properly, while 45% need recipes prepared with leftovers, 39% need to be better informed about organizations and initiatives that address the prevention and/or reduction of food waste (e. g. food banks), and 33% require more information about the freshness of food.

### CONCLUSIONS

The survey shows that household food waste in Algeria is a real concern considering way of food shopping (daily), the big part of salaries dedicated to food. In fact, it seems that there is still some confusion regarding date labels, which increases the amount of FW. This result represents a big problem as the sample has good education. Bread and cereals products are the most wasted food category by Algerian households followed by vegetables and dairy products. Actually, the Algerian cuisine is mainly based on bakery products (couscous, *chakhchoukha*,

etc.) and bread. Nevertheless, the survey revealed also some positive aspects such as the high level of awareness among Algerian households about food waste negative economic and environmental impacts at short and long time as well as readiness of more than 90% of Algerians to change their behaviour to reduce food wastage. Current support policies of food price had a very negative effect on consumption behaviour among Algerians. However, fall in oil prices and the declared austerity policy in the public budget are likely to change bad habits in terms of food consumption and consequently also wastage. That being said, awareness raising campaigns about the economic and environmental consequences of food waste are key to improve food consumption behaviour among Algerian people. Public, religious and academic institutions can play a key role in raising awareness about the far-reaching implications of food wastage on the present and the future of the country.

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