

THE AGRO-FOOD INDUSTRIAL WASTES IN THE PERCEPTION OF THE INHABITANTS FROM EASTERN ROMANIA AND THE REPUBLIC OF MOLDOVA

DEȘEURILE INDUSTRIALE AGROALIMENTARE ÎN PERCEPȚIA LOCUIȚORILOR DIN ESTUL ROMÂNIEI ȘI REPUBLICA MOLDOVA

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Abstract. *The agro-food industry is a very important part of the world's economy, which continuously expands in both, Romania and Republic of Moldova. But, unfortunately, it generates huge quantities of wastes. An agro-food wastes related survey was applied to 263 consumers from Eastern Romania (116) and Republic of Moldova (147) in order to assess the population's opinion concerning this category of waste. 145 of the interviewees were women and 118 were men. The predominant age groups were: 40-50 years (55 persons), 30-40 years (52 persons) and 20-30 (51 persons). The profession distribution was: 62 - students, 46 - self-employed and unemployed, 41 - workers, 20 - technicians, 19 - retired, 17 - engineers, 16 - teachers, 13 - drivers, 13 - scholars, and others.*

Concerning the survey results, 37% of the 263 respondents considered that the agro-food industrial waste represent a moderate problem for the place where they live, while 25% considered a major problem. 43% appreciated that the agro-food wastes seriously affect the environment and 26% - moderate affect. The population from both countries has a concern to separate the wastes: major (25%), moderate (30%), small concern (22%), do not know (12%), and not at all (11%). They consider that the agro-industrial wastes can be recovered: largely (40%), moderate (34%), in small extent (14%), do not know (10%) and not at all (2%). In the place where they live, the waste is highly processed: 27% - do not know, 25% - not at all, 21% - highly, 17% - medium, 10% - little. The majority (82%) consider that it is strongly necessary to tighten the responsibility for disposing the agro-industrial waste in places not intended and 13% moderate necessary. Also, 67% appreciate that the agro-industrial waste processing is highly required and 25% - moderate required. 69% from the surveyed people consider a

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major problem the need for national/international projects in the domain of processing the agro-industrial waste, and 19% consider a moderate problem.

In conclusion, the superior valorization of agro-food industrial wastes is a general aspiration of most of the population and could bring economic, social and environmental benefits.

Key words: economy, opinion of the population, recovery, survey, valorization

Rezumat. Industria agroalimentară este o parte foarte importantă a economiei mondiale, care se extinde continuu atât în România, cât și în Republica Moldova. Dar, din păcate, generează cantități uriașe de deșeuri. Un chestionar referitor la deșeurile agroalimentare a fost aplicat la 263 de consumatori din Estul României (116) și Republica Moldova (147) pentru a evalua opinia populației cu privire la această categorie de deșeuri. 145 dintre cei intervievați au fost femei și 118 bărbați. Grupele de vârstă predominante au fost: 40-50 ani (55 persoane), 30-40 ani (52 persoane) și 20-30 ani (51 persoane). Repartizarea profesiilor a fost: 62 - studenți, 46 – liber profesioniști și șomeri, 41 - muncitori, 20 - tehnicieni, 19 - pensionari, 17 - ingineri, 16 – învățători/profesori, 13 - șoferi, 13 - elevi și altele.

În ceea ce privesc rezultatele sondajului, 37% dintre cei 263 intervievați au considerat că deșeurile industriale agroalimentare reprezintă o problemă moderată pentru locul în care locuiesc, în timp ce 25% au considerat o problemă majoră. 43% au apreciat că deșeurile agro-alimentare afectează grav mediul, iar 26% că afectează moderat. Populația din ambele țări are o preocupare de a separa deșeurile: majoră (25%), moderată (30%), preocupare mică (22%), nu știu (12%) și deloc (11%). Ei consideră că deșeurile agroindustriale pot fi recuperate: în mare măsură (40%), moderat (34%), mică măsură (14%), nu știu (10%) și deloc (2%). În localitatea în care locuiesc, deșeurile sunt foarte procesate: 27% - nu știu, 25% - deloc, 21% - foarte mult, 17% - mediu, 10% - puțin. Majoritatea (82%) consideră că este absolut necesară înăsprirea responsabilității pentru depozitarea deșeurilor agroindustriale în locuri nedestinate și 13% moderat necesară. De asemenea, 67% apreciază că prelucrarea deșeurilor agroindustriale este foarte importantă, iar 25% - moderată. 69% dintre persoanele chestionate consideră o problemă majoră necesitatea proiectelor naționale/internaționale în domeniul procesării deșeurilor agroindustriale, iar 19% consideră o problemă moderată.

În concluzie, valorificarea superioară a deșeurilor industriale agroalimentare este o aspirație generală a majorității populației și ar putea aduce beneficii economice, sociale și de mediu.

Cuvinte cheie: economie, opinia populației, recuperare, chestionar, valorificare

INTRODUCTION

The agro-food industry is a very important part of the economy of most countries, and this also applies to Romania and Republic of Moldova. The continuous increase of the population substantially contributes to its development. But, unfortunately, any kind of agro-food processing technology, and especially those concerning the horticultural raw materials, as fruits and vegetables, generate huge quantities of wastes. Gowe affirmed that fruit and vegetable processing units commonly produce the highest quantities of wastes into the environment, followed by household garbage (Gowe, 2015). The consumers behavior leads to important quantities of waste resulted from the wasted food (Pocol *et al.*, 2020).

The most developed countries are taking intensive measures for reducing both agro-food processing waste and food waste (Hamam *et al.*, 2021). In Australia was announced a National Food Waste Strategy (Commonwealth of Australia, 2017), which was followed up by an industry led Fight Food Waste Cooperative Research Center (FFWCRC, 2018). At the same time, many efforts focus on the valorization of agro-food waste through various directions (Yusuf, 2017). At present moment, the valorization of agro-food wastes is insufficient and big quantities of waste pollute the environment. The environmental pollution is accompanied by unpleasant effects (bad smell, insects or animals attracted by the wastes, etc.), affecting the inhabitants from the vicinity of the processing companies. The present study has the aim to evaluate the opinion of the population living in the proximity of different small, medium or large companies dealing with fruits/vegetables processing, or winemaking, concerning the agro-food wastes.

MATERIAL AND METHOD

A survey related to agro-food wastes of horticultural origin was applied to 263 consumers from Eastern Romania (116) and Republic of Moldova (147), in order to assess the opinion of the population living in the neighborhood of the companies which process fruits (including grapes) and vegetables. The survey regards the environmental implications, the level of agro-industrial waste processing, the concern of the locals, the involvement of local authorities, etc. In Romania, it was distributed in Tecuci (next to SC Contec Foods SRL), in Iasi (next to Research Development Station for Viticulture and Winemaking Iasi), in Tomesti (next to Conacul Goruni, SC Silver Rom Agro SRL a small company processing apple juice), in Hlincea (next to Presa pentru Procesare Fructe, a small private fruit processing press used for apple juice), and similar in Republic of Moldova (rural population next to processing companies from Chisinau area and other locations, were interviewed).

The survey consists of the following 12 questions, and also, personal information concerning the age, sex, and profession of the respondents:

- Q1. Agro-industrial waste is a problem for my locality?
- Q2. Agro-industrial waste affects the environment?
- Q3. People around me are concerned about waste separation?
- Q4. Agro-industrial waste can be recovered?

- Q5. Agro-industrial wastes in my locality are processed at a high level?
 Q6. The contribution of local authorities in agro-industrial waste management is high?
 Q7. The processing companies are actively involved in the management of agro-industrial waste?
 Q8. Is it necessary to tighten the responsibility for disposing of agro-industrial waste in places not intended?
 Q9. Agro-industrial waste processing is required?
 Q10. Products used in the food and cosmetic industries can be obtained from agro-industrial waste?
 Q11. Is it necessary to inform the population about the importance of waste recovery?
 Q12. Is there a need for national/international projects in the field of agro-industrial waste recovery?

The respondents had to appreciate their answers, using numbers: 3-Major problem, 2-Moderate problem, 1-Small problem, 0-Not at all, x-Do not know.

RESULTS AND DISCUSSIONS

The gender of the respondents is: women - 145 (55%) and men – 118 (45%).

The predominant age groups from both Romania and Moldova (Fig. 1 A) are 20-30 years (20%), 30-40 years (20%) and 40-50 years (21%), while the less represented are people over 70 years (2%). From the profession point of view (Fig. 1 B), the main categories are 24% students, 17% unemployed or self-employed, 16% workers, 8% technicians, and also, retired, engineers, teachers, drivers, scholars, sellers and house keepers.

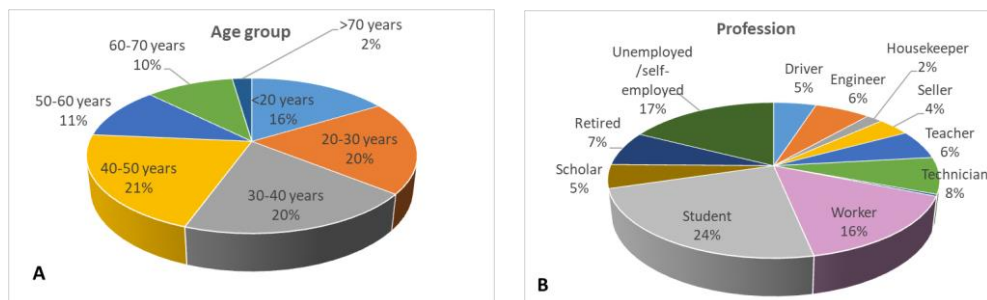
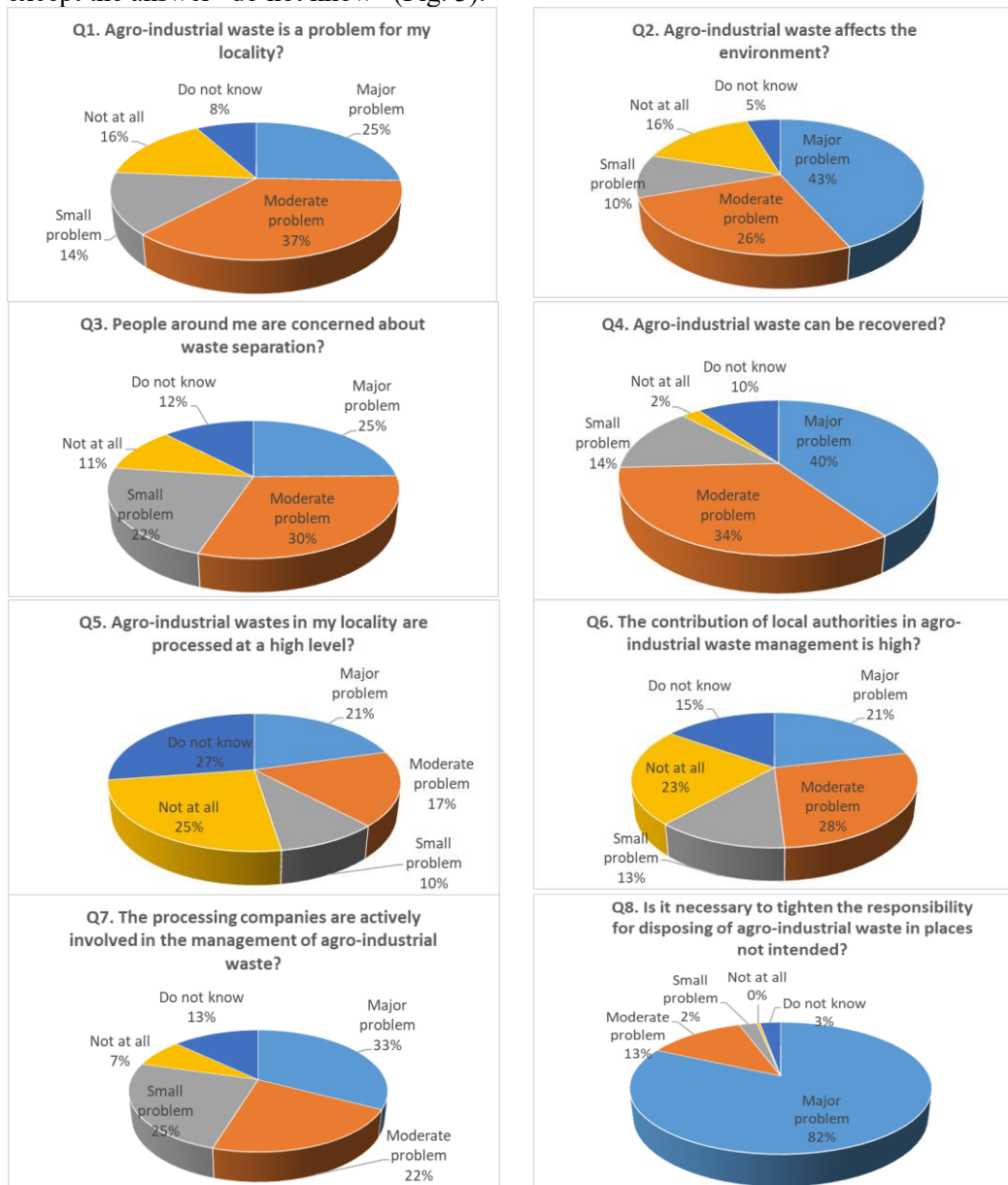


Fig. 1. Repartition of the respondents from both Romania and Moldova in age groups (A) and professions (B)

The survey results for each question are reflected in Fig. 2. From the total respondents of both countries, 62% consider that the agro-industrial waste is a major (25%) or moderate (37%) problem, while 30% appreciate that it is a small (14%) or no problem (16%) and 8% do not know (Q1). The comparative appreciation of the interviewed people from Romania versus Moldova

(concerning Q1) can be seen in Fig. 3. We noticed huge differences between the opinions of the respondents of the two countries, related to all the answers to Q1, except the answer “do not know” (Fig. 3).



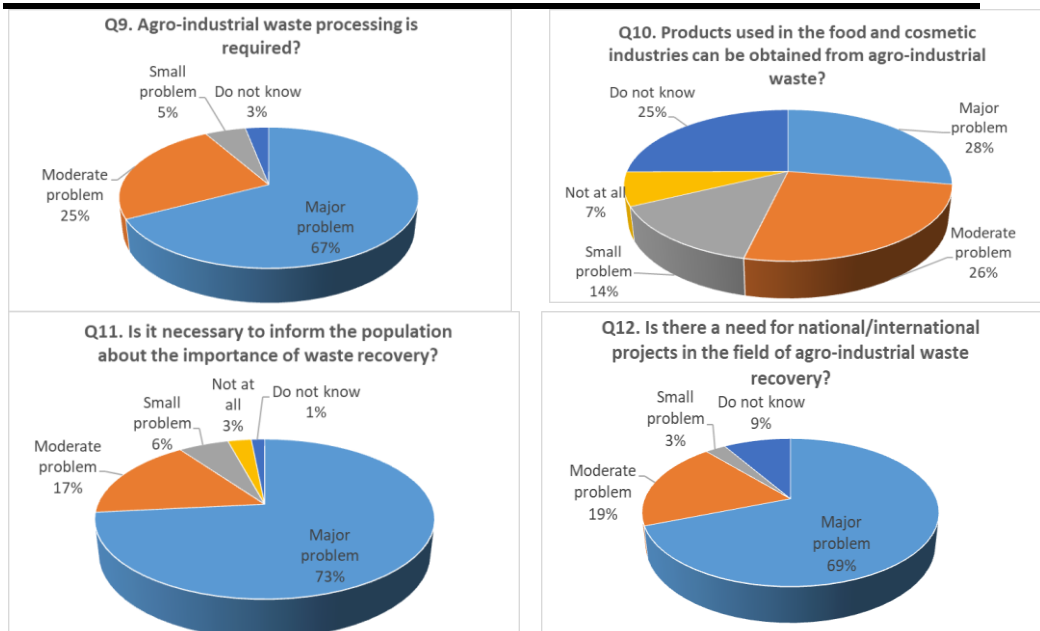


Fig. 2. Survey results for each question (Q1 – Q12), considering all the respondents from both countries

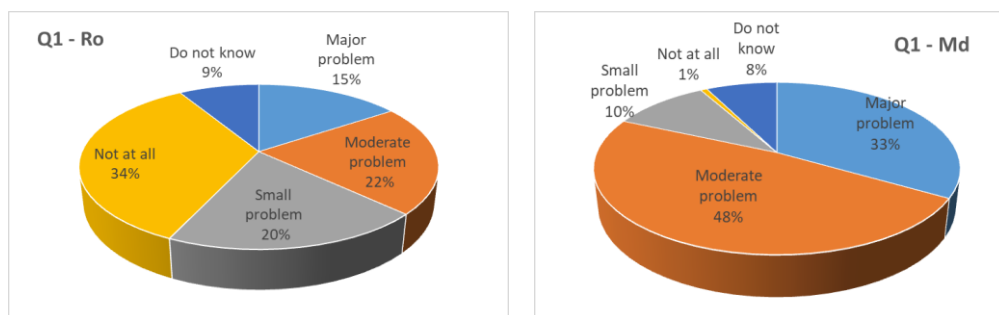


Fig. 3. Comparative appreciation of the interviewed people from Romania (Q1 - Ro) versus Moldova (Q1 - Md) concerning Q1: Agro-industrial waste is a problem for my locality?

Concerning the influence upon the environment (Q2), per total, a majority of 69% interviewed people is aware of the problem represented by this type of waste (43% - major and 26% moderate problem), while 16% consider it is not a problem (Fig. 2). But, comparing the answers of Romanians versus Moldavians (Fig. 4), 35% of the questioned Romanians consider it is not a problem and only 23% consider it a major problem, while 60% of the questioned Moldavians appreciate it a major problem and none of them answered “not at all”. It would be interesting to research deeply in the future, if this difference is coming from a better agro-industrial waste management in Romania, or not.

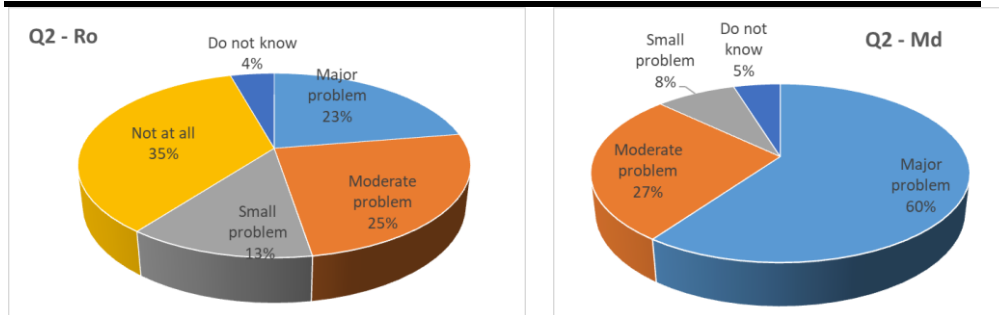


Fig. 4. Comparative appreciation of the interviewed people from Romania (Q2 - Ro) versus Moldova (Q2 - Md) concerning Q2: Agro-industrial waste affects the environment?

Concerning Q3, there is a concordance in the opinion of the interviewed people from both countries (Fig. 5), excepting those which answered “do not know”. Summative, they consider that people around are concerned about waste separation (55%): majoritary (25%) or moderate (30%), while 11% mentioned “not at all” and a mean of 12% - “do not know” (Fig. 2).

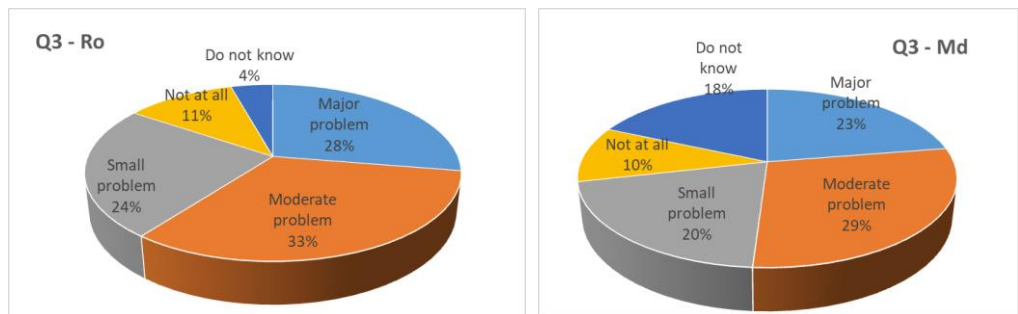


Fig. 5. Comparative appreciation of the interviewed people from Romania (Q3 - Ro) versus Moldova (Q3 - Md) concerning Q3: People around me are concerned about waste separation?

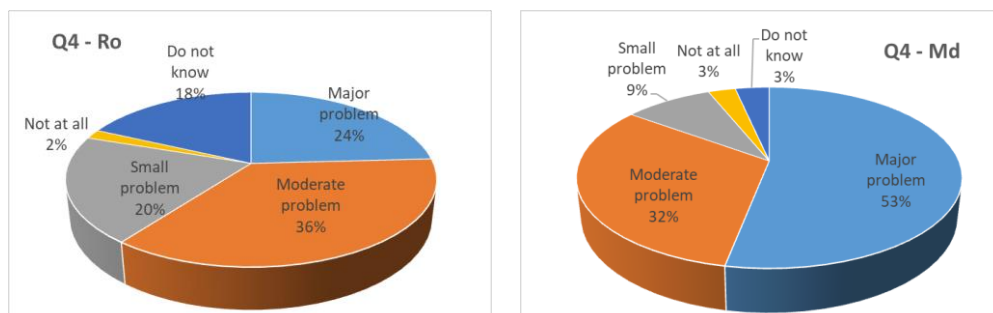


Fig. 6. Comparative appreciation of the interviewed people from Romania (Q4 - Ro) versus Moldova (Q4 - Md) concerning Q4: Agro-industrial waste can be recovered?

Relative to Q4 (Agro-industrial waste can be recovered?), the summative answer was 40% - largely (with 24% from Romanians and 53% from Moldavians), 34% - moderately (with 36% from Romanians and 32% from Moldavians), while around 2% mentioned “not at all” and 10% - “do not know” (Fig. 2 and Fig. 6).

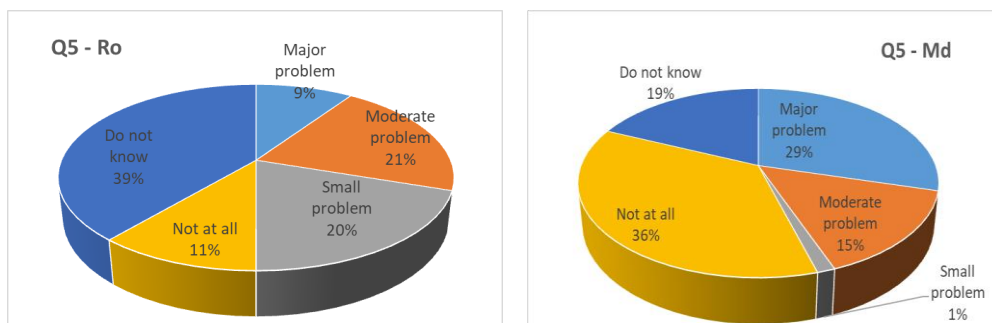


Fig. 7. Comparative appreciation of the interviewed people from Romania (Q5 - Ro) versus Moldova (Q5 - Md) concerning Q5: Agro-industrial wastes in my locality are processed at a high level?

Concerning Q5 (Agro-industrial wastes in my locality are processed at a high level?), the majority of the respondents (52%) answered “not at all” – 25% (with 11% - coming from Romanians and 36% - from Moldavians) or “do not know” – 27% (with 39% - from Romanians and 19% - from Moldavians). Only 10% considered the wastes are processed to a small extent, 17% - to a moderate extent and 21% - to a high extent (Fig. 2 and Fig. 7).

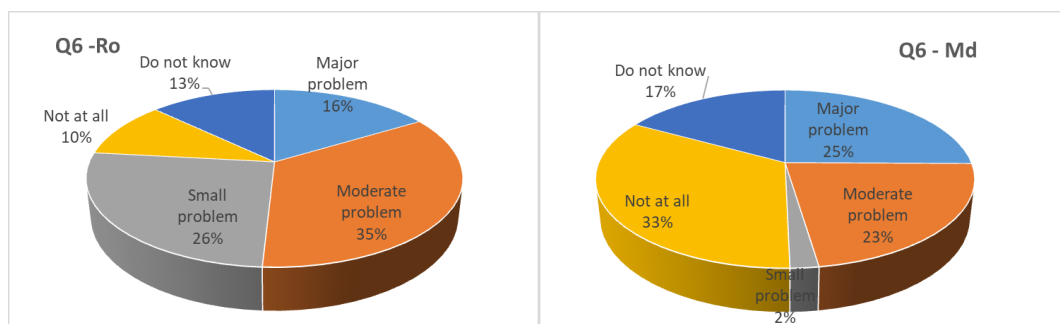


Fig. 8. Comparative appreciation of the interviewed people from Romania (Q6 - Ro) versus Moldova (Q6 - Md) concerning Q6: The contribution of local authorities in agro-industrial waste management is high?

Related to the contribution of local authorities in the agro-industrial waste management (Q6), 51% of the Romanian respondents considered major (16%) and moderate (35%) extent, 26% - small extent and 10% considered “not at all”; while 48% of the Moldavian respondents considered major (25%) and moderate

(23%) extent, 2% - small extent and 33% considered that the local authorities are “not at all” involved in the agro-industrial waste management (Fig. 8). Globally, the respondents from both countries appreciated: 21% - major extent, 28% - moderate extent, 13% - small extent, 23% - “not at all” and 15% - “do not know” (Fig. 2).

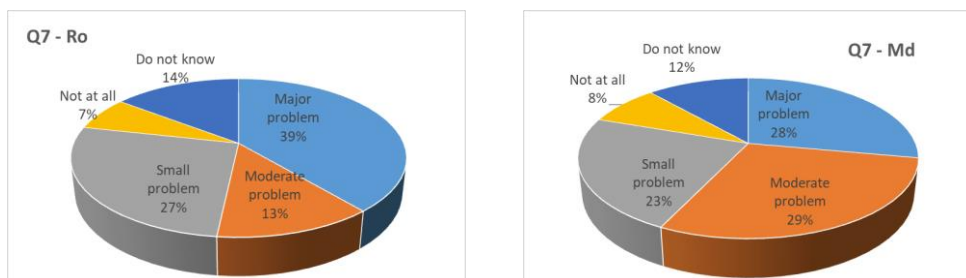


Fig. 9. Comparative appreciation of the interviewed people from Romania (Q7 - Ro) versus Moldova (Q7 - Md) concerning Q7: The processing companies are actively involved in the management of agro-industrial waste?

Concerning the involvement of processing companies, in the management of the agro-industrial waste (Q7), 55% of the interviewed people positively appreciated it to a major and moderate extent, 25% to a small extent and only 7% to “not at all” (Fig. 2). The Romanian interviewed considered: 39% - major extent, 13% - moderate, 27% - small extent, while the Moldavian interviewed: 28% - major, 29% - moderate, 23% - small extent. As can be seen from Fig. 9, “not at all” and “do not know” appreciations had closed values for both countries.

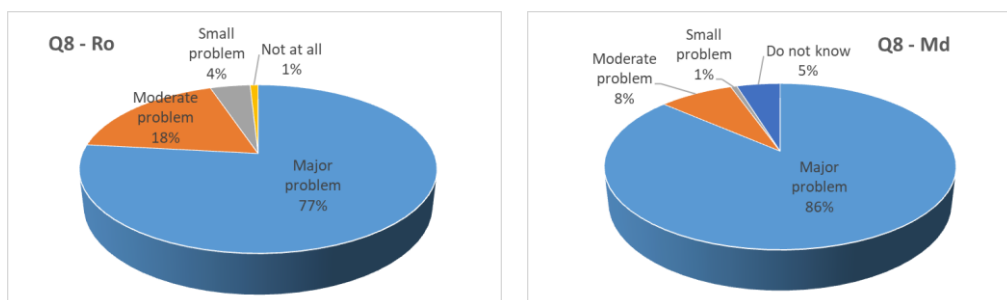


Fig. 10. Comparative appreciation of the interviewed people from Romania (Q8 - Ro) versus Moldova (Q8 - Md) concerning Q8: Is it necessary to tighten the responsibility for disposing of agro-industrial waste in places not intended?

Concerning the necessity to tighten the responsibility for disposing the agro-industrial waste in places not intended (Q8), 82% from all the respondents appreciated it in a major extent and 13% in a moderate extent (Fig. 2). Comparing the respondents from the two countries, Romanians: 77% - major extent, 18% -

moderate extent, and Moldavians: 86% - major extent, 8% - moderate extent (Fig. 10).

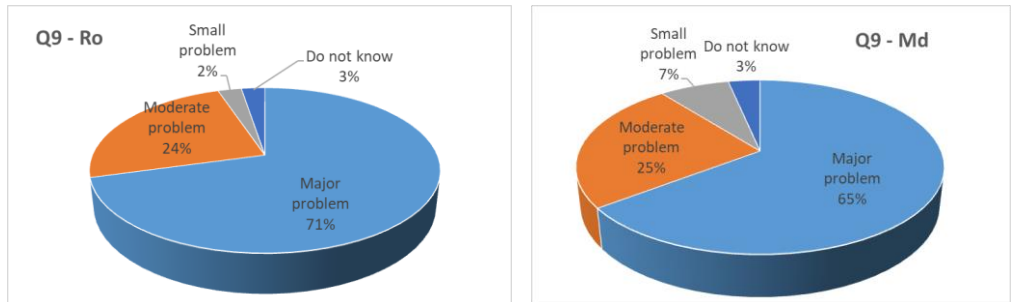


Fig. 11. Comparative appreciation of the interviewed people from Romania (Q9 - Ro) versus Moldova (Q9 - Md) concerning Q9: Agro-industrial waste processing is required?

Referring to Q9 (Agro-industrial waste processing is required?), 92% from total interviewed persons appreciated it in a major (67%) and moderate (25%) extent and no one (0%) mentioned “not at all” (Fig. 2). From the Romanian respondents, 95% answered a major (71%) and moderate (24%) extent, while from the Moldavian respondents, 90% answered a major (65%) and moderate (25%) extent (Fig. 11).

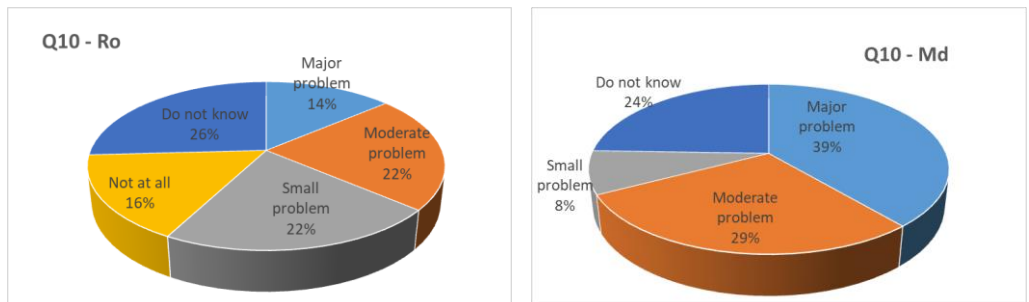


Fig. 12. Comparative appreciation of the interviewed people from Romania (Q10 - Ro) versus Moldova (Q10 - Md) concerning Q10: Products used in the food and cosmetic industries can be obtained from agro-industrial waste?

Concerning Q10 (Products used in the food and cosmetic industries can be obtained from agro-industrial waste?), the respondents from Moldova are more optimistic, as 39% appreciated as major, 29% as moderate extent, and no one answered “not at all”, while from Romania, only 14% appreciated as major, 22% as moderate extent and 16% answered “not at all” (Fig. 12). Calculating the results for both countries, 28% from total interviewed considered in a major extent and 26% in a moderate extent (Fig. 2).

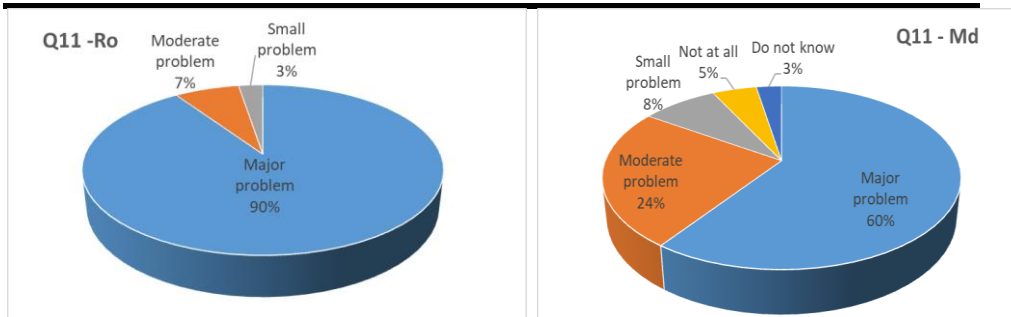


Fig. 13. Comparative appreciation of the interviewed people from Romania (Q11 - Ro) versus Moldova (Q11 - Md) concerning Q11: Is it necessary to inform the population about the importance of waste recovery?

The question 11 (Q11: Is it necessary to inform the population about the importance of waste recovery?) received positive answers with 73% - major, 17% - moderate and 6% small extent (Fig. 2). Analyzing the answers per each country, the Romanians appreciated 90% - major, 7% - moderate and 3% - small extent, while the Moldavians appreciated 60% - major, 24% - moderate, 8% - small extent, 5% - “not at all” and 3% - “do not know” (Fig. 13).

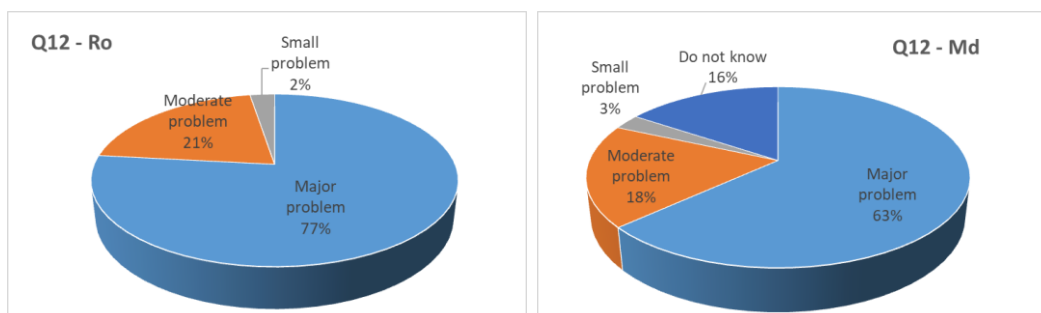


Fig. 14. Comparative appreciation of the interviewed people from Romania (Q12 - Ro) versus Moldova (Q12 - Md) concerning Q12: Is there a need for national/international projects in the field of agro-industrial waste recovery?

Concerning Q12 (Is there a need for national/international projects in the field of agro-industrial waste recovery?), the respondents from both countries appreciated in a major (69%), moderate (19%), or small extent (3%) and 9% mentioned that they “do not know” (Fig. 2). The differences between the answers of the interviewed people from the two countries are presented in Fig. 14.

CONCLUSIONS

The population of both countries is aware of the importance of the organized and intelligent processing of the agro-food industrial waste.

The superior valorization of agro-food industrial wastes is a general aspiration of most of the population and could bring economic, social and environmental benefits.

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REFERENCES

1. Gowe C., 2015 - Review on potential use of fruit and vegetables by-products as a valuable source of natural food additives. Food Science and Quality Management, 45(5), p. 47-61.
2. Hamam M., Chinnici G., Di Vita G., Pappalardo G., Pecorino B., Maesano G., D'Amico M., 2021 - Circular economy models in agro-food systems: A review. Sustainability, 13(6), 3453.
3. Pocol C. B., Pinoteau M., Amuza A., Burlea-Schiopoiu A., Glogovețan A. I., 2020 - Food waste behavior among Romanian consumers: A cluster analysis. Sustainability, 12(22), 9708.
4. Yusuf M., 2017 - Agro-industrial waste materials and their recycled value-added applications. Handbook of Ecomaterials, 1, p. 1-11.
5. ***, 2017 - National Food Waste Strategy: Halving Australia's Food Waste by 2030. Commonwealth of Australia, Canberra, Australia.
6. ***, 2018 - Fight Food Waste Cooperative Research Centre. Australian Government. Department of Industry, Science, Energy and Resources. <https://www.fightfoodwastecrc.com.au/>.