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## THE EVOLUTION OF FOOD PRODUCTS CONSUMPTION IN REPUBLIC OF MOLDOVA IN THE DEMOGRAPHIC TRANSITION PERIOD

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**Abstract.** Republic of Moldova has experienced economic changes in the past three decades. This has resulted in sustained increase in consumer income, which in turn has led to important changes in food consumption. This report examines the recent trends in Moldova's food consumption, with a focus on the period of 1990-2017. Data for Food intake recommendations of the World Health Organization (WHO) are used as a starting point to look into Moldova's likely future demand and possible import needs. The article analyzes the consumption of basic products by the population of Moldova from the point of view of ensuring the economic and physical accessibility of food, the trends in changes in the volume and structure of consumption are revealed; assessment of the degree of achievement of rational norms. To assess the quality of diets, their energy and nutritional values there have been investigated: the content of energy, proteins, including animal origin, fats and carbohydrates.

**Keywords:** *food consumption, production growth, nutrition, diet's quality, autochthon outlook.*

### Introduction

Changes in agricultural practice over the past 50 years have increased the world's capacity to provide food for its people through increases in productivity, greater diversity of foods and less seasonal dependence. Food availability has also increased because of rising income levels and falling food prices [1]. Promoting healthy diets and lifestyles to reduce the global burden of noncommunicable diseases requires a multisectoral approach involving the various relevant sectors in societies [2]. The agriculture and food sector figures prominently in this enterprise and must be given due importance in any consideration of the promotion of healthy diets for individuals and population groups [3].

Such numbers can determine the role of food in the process of continuous renewal of the human body: it is estimated that in 70 years of life a person drinks 50 tons of water, eats 2.5 tons of protein, 2.3 tons of fat, over 10 tons of carbohydrates, almost 300 kilograms of salt. Proteins, fats, carbohydrates, mineral salts and vitamins - these are the components of food that are necessary for life. Scientific studies have revealed the required number of food products that fully satisfy the human need for the above elements. The duty of the state in

this case is to ensure food security [4]. Food security means ensuring for the entire population, regardless of social and economic status, access to food stocks of sufficient quantity and quality [12]. Reliable food supplies meet the needs of consumers, without jeopardizing the production process in the short or long term. It ensures the sustainability of supply and, at the same time, takes due account of the safety of production methods and the food availability of products produced [5, 9]. In addition, food security means that everyone always has both physical and economic access to such a quantity of foodstuffs, which is enough for an active, healthy lifestyle. In this article, some quantitative comparisons and qualitative explanations are presented to know better food consumption in Republic of Moldova in different periods.

### Materials and Methods

This paper sets as the object of study - the current situation in the field of nutrition of the population of the Republic of Moldova in the period 1990 - 2017. The statistics are obtained from official sources. - Anuarul Statistic al RM [6].

### Research methods

As the research methods were used the method of studying statistical aggregates, the method of statistical observation - questioning, summary and grouping of materials of statistical observation, method of empirical research - comparison [3].

Food consumption per capita per day (Table 1) is a key variable used for measuring the evolution of the global and regional food situation [7]. Food production and consumption may be measured in a variety of ways, most commonly in terms of either expenditures or caloric content.

Further a comparative analysis is conducted between normative (by WHO data) and the factual consumption queries in Republic of Moldova.

### Results and discussions

#### Availability and changes in consumption of animal products

##### *Meat and meat products.*

As can be seen from Table 1, consumption in the 1990s, the average of which reached the minimum in 1996-2000, constituted 35,96 % of the norms. This is due to the economic crisis of the 2000s and the decline in the general welfare of the population. Then, the rate of animal protein intake began to grow and reached a peak in 2016-2017, reaching 48,9 kg per capita per year, which is 69,76% of the WHO standard. FAO's research talks about meat starvation of the world's population [8]. There is also a version of FAO that these statistics are typical for developing countries, which include the Republic of Moldova.

Table 1.

Food consumption per capita, kg/year							
Period	Product groups						
	<i>Meat, meat products</i>	<i>Milk, dairy products</i>	<i>Eggs</i>	<i>Potatoes</i>	<i>Vegetables</i>	<i>Fruits, berries, grapes</i>	<i>Bread, pastry, pasta, cereals and legumes.</i>
<b>WHO recomm.</b>	<b>70,1</b>	<b>404</b>	<b>243</b>	<b>96,7</b>	<b>140,3</b>	<b>80,3</b>	<b>120,5</b>
1990	58	303	203	69	112	79	171

Continuation Table 1

1991	56	259	194	68	113	79	174
1992	46	198	166	67	95	63	170
1993	35	174	130	95	94	80	170
1994	30	163	100	84	78	68	138
1995	24	165	107	68	86	30	135
Average kg/year 1990-1995	<b>41,50</b>	<b>210,33</b>	<b>150,00</b>	<b>75,17</b>	<b>96,33</b>	<b>66,50</b>	<b>159,67</b>
<b>%WHO 1990-1995</b>	<b>59,20</b>	<b>52,06</b>	<b>61,73</b>	<b>77,73</b>	<b>68,66</b>	<b>82,81</b>	<b>132,50</b>
1996	25	161	116	71	65	59	127
1997	25	155	121	69	69	78	135
1998	27	155	122	65	113	48	134
1999	25	145	132	62	109	27	133
2000	24	153	133	53	83	32	134
Average kg/year 1996-2000	<b>25,2</b>	<b>153,8</b>	<b>124,8</b>	<b>64</b>	<b>87,8</b>	<b>48,8</b>	<b>132,6</b>
<b>%WHO 1996-2000</b>	<b>35,95</b>	<b>38,07</b>	<b>51,36</b>	<b>66,18</b>	<b>62,58</b>	<b>60,77</b>	<b>110,04</b>
2001	24	155	139	65	104	33	139
2002	27	167	158	68	99	38	141
2003	27	164	158	69	107	43	133
2004	32	166	162	63	88	38	146
2005	40	174	177	75	101	37	142
Average kg/year 2001-2005	<b>30</b>	<b>165,2</b>	<b>158,8</b>	<b>68</b>	<b>99,8</b>	<b>37,8</b>	<b>140,2</b>
<b>%WHO 2001-2005</b>	<b>42,80</b>	<b>40,89</b>	<b>65,35</b>	<b>70,32</b>	<b>71,13</b>	<b>47,07</b>	<b>116,35</b>
2006	38	177	168	88	132	39	136
2007	36	175	177	59	76	28	119
2008	32	155	141	88	99	41	123
2009	30	169	162	59	106	35	119
2010	43	159	160	54	92	62	101
Average kg/year 2006-2010	<b>35,8</b>	<b>167</b>	<b>161,6</b>	<b>69,6</b>	<b>101</b>	<b>41</b>	<b>119,6</b>
<b>%WHO 2006-2010</b>	<b>51,07</b>	<b>41,34</b>	<b>66,50</b>	<b>71,98</b>	<b>71,99</b>	<b>51,06</b>	<b>99,25</b>
2011	38	170	190	60	115	43	116
2012	40	171	156	52	78	41	109
2013	46	166	165	53	86	42	106
2014	43	212	180	47	104	71	110
2015	43	159	160	54	92	62	101
Average kg/year 2010-2015	<b>42</b>	<b>175,6</b>	<b>170,2</b>	<b>53,2</b>	<b>95</b>	<b>51,8</b>	<b>108,4</b>
<b>%WHO 2010-2015</b>	<b>59,91</b>	<b>43,47</b>	<b>70,04</b>	<b>55,02</b>	<b>67,71</b>	<b>64,51</b>	<b>89,96</b>
2016	47,1	217,5	186	47,5	114,2	49,3	116,8
2017	50,7	227	197	46	117,8	51,8	121,7
Average kg/year 2016 - 2017	<b>48,9</b>	<b>222,25</b>	<b>191,5</b>	<b>46,75</b>	<b>116</b>	<b>50,55</b>	<b>119,25</b>
<b>%WHO 2016-2017</b>	<b>69,76</b>	<b>55,01</b>	<b>78,81</b>	<b>48,35</b>	<b>82,68</b>	<b>62,95</b>	<b>98,96</b>

Source: Biroul National de Statistica

### *Milk and dairy products*

From Table 1 it can be seen that for a long period people do not receive enough milk and dairy products. The gap between the norm and the maximum consumption over the past 25 years in the Republic of Moldova is more than 2 times. Since the 1990s, the average annual consumption of dairy products has significantly decreased, reaching 159 kg/year in 2015, which is 39% of the WHO standard. The situation seems to have a positive trend in the last years, having an average consumption of dairy products of 222,5 kg/year for the 2016-2017 period. FAO data on the consumption of milk and dairy products also confirm a large gap with the norm and reflect disappointing forecasts, despite positive trends since the beginning of 2000.

### *Eggs.*

The consumption of eggs in the Republic of Moldova varies from 100 to 200 pieces per person per year, given that WHO recommends using 243 eggs per year. In general, Moldova's indicators are not bad - on average they exceed 50% of the norm, having the same increasing trend as for dairy products. Since 1995, there has been a steady upward trend in the consumption of egg products, which has a positive effect on the health of society. The percentage of covering the WHO norms for 2016-2017 period reaches 78,81 %.

## **Availability and changes in consumption of plant origin products**

### *Potatoes.*

Potatoes are one of the most affordable products for all social groups and are the basis of the diet of most families. Accordingly, the level of consumption of potatoes by the people of the Republic of Moldova is high. The closest indicators to the norm were revealed in 1994, 2006 and 2008 (91% of the WHO norm). Potato consumption is then significantly reduced due to the availability of other carbohydrate products and the expansion of the range on the market. The lowest indicator was registered in 2016 - 46 kg/person/year, which is 47,7%.

### *Vegetables.*

Recommended consumption rates are sustained only in 2006, when the consumption reached 132 kg/person/year. The remaining data vary from year to year, while there is no clear trend to increase or decrease the number of consumed vegetables. The Republic of Moldova is an agrarian country, we have a large variety of fruits and vegetables, but at the same time, the yield of a particular year depends on many factors. Accordingly, the affordability of vegetables is determined by the yield. The lowest consumption of vegetables, which are the main sources of fibers, was recorded in 1996, 2007 and 2012, accounting for about 50% of the norm. Analyzing the trends for the last three years, we can say that the vegetable consumption shows an increasing trend, covering 116% of the WHO norms. This values show the population concern for a healthier lifestyle.

### *Fruits, berries and grapes.*

Nowadays, not only in the world, but also in our country, young people started to give preference to a healthy diet, to make a choice in favor of a healthy and nutritionally balanced diet. Compared with the beginning of the 2000s, when fruit consumption was about 50% of the norm, in 2014 fruit consumption was 71 kg/person/year, which is 89% of the WHO norm. However, this trend has not yet become fundamental, so that it can be allowed to drift. It is safe to say that without adequate support, it can come to naught. Therefore, widespread agitation of healthy eating with the involvement of the media is very important.

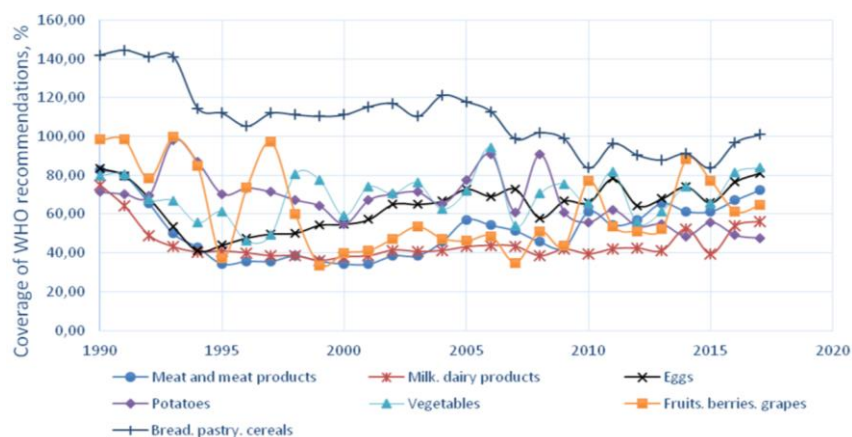
*Bread and pastry, pasta, cereals and legumes.*

Until 2010, the consumption of bread is much higher than the rational norm. Only in the last 7 years, a decline in the consumption of flour and pasta has been recorded, which is a positive trend in public health. In 2011, compliance with the WHO standard of 120 kg per person per year was achieved. In the last 5 years, there has been an insufficient intake of complex carbohydrates, which is not a favorable factor for the population.

Analysis of food consumption indicates that the key deviations from the recommendations were characteristic for the period 1990-2005. Since 2005, we have seen a stabilization of consumption across all product groups. It is clear from the diagram that food consumption meets the WHO recommended guidelines within the range of 60-80%. Less dairy products are consumed, and the 80-100% coverage is achieved only in the case of bread, cereals and vegetables in the period 2015-2017.

Figure 1 presents the food requirements coverage in Moldova according to WHO recommendations. As it can be seen from the figure 1, the only group of products that overpasses the WHO recommendation is bread and cereals, all the others showing an unstable trend (sometimes increasing, sometimes decreasing).

As a summary, in general, the consumption of some food products in Republic of Moldova has slightly decreased (potatoes, bread and pastry) while the consumption of other products has increased (fresh meat, eggs and vegetables). Altogether, food consumption in Moldova, in quantity terms is still under the recommendation of WHO.



**Figure 1.** Food requirements coverage (%) in Moldova according to WHO recommendations.

Product consumption per capita analysis is not sufficient to assess the true consumption of products of rational standards recommended by the WHO. To assess the quality of diets, their energy and nutritional values there have been investigated: the content of energy, proteins, including animal origin, fats and carbohydrates. WHO developed norms of physiological needs for energy and food [10, 11]. However, these norms are established for different age and gender groups of the population (Table 2).

Compared to the nutritional intake values recommended by the World Health Organization (WHO), the composition of an average citizen's diet in the Republic of Moldova includes adequate proportions of carbohydrates and proteins but contains a certain excess of fat. In 2013, the average energy intake in the Republic of Moldova contained 54% of carbohydrates, 35% of fat and 11% of protein. For the other periods the values are shown below (Table 2, Figure 2).

Daily food consumption per capita, increased from 2413,4 calories in 2006 to 2529 calories in 2017. As the table shows, this slight increase is due to the increasing consumption of animal products. Starting with 2013 the daily energy intake has started to recover, although it has not yet reached the values recommended by the WHO until 2017.

Protein consumption increased during the analyzed period from 65,7 in 2006 to 72,7 g in 2017. This data are also confirmed and by the increasing meat consumption during this period.

Table 2.

### Food consumption on Calories and Nutritional Factors

Year	Calories	Calories from animal sources	Proteins, g	Lipids, g	Sugars, g
<b>WHO recommendation</b>	<b>2520</b>	-	<b>78</b>	<b>70</b>	<b>395</b>
2006	2 413,4	502,2	65,7	86,4	345,1
2007	2 273,1	504,5	62,2	82,5	321,3
2008	2 203,7	440,8	58,1	80,3	314,7
2009	2 240,3	473,3	60,7	83,0	317,5
2010	2 210,7	477,5	60,0	82,6	311,4
Average kg/year <sub>2006-2010</sub>	<b>2310,20</b>	<b>479,66</b>	<b>64,12</b>	<b>80,80</b>	<b>334,17</b>
<b>%WHO 2006-2010</b>	<b>91,67</b>		<b>82,20</b>	<b>115,43</b>	<b>84,60</b>
2011	2 258,3	516,1	61,6	87,4	310,9
2012	2 291,8	548,0	63,3	89,8	313,8
2013	2 320,1	553,1	65,2	91,2	316,5
2014	2 329,4	549,2	66,0	92,0	316,7
2015	2 372,3	570,8	67,7	92,6	323,7
Average kg/year <sub>2011-2015</sub>	<b>2314,38</b>	<b>547,44</b>	<b>64,76</b>	<b>90,60</b>	<b>316,32</b>
<b>%WHO <sub>2011-2015</sub></b>	<b>91,84</b>		<b>83,03</b>	<b>129,43</b>	<b>80,08</b>
2016	2 441,7	583,3	69,3	95,2	333,2
2017	2 529,3	615,5	72,7	98,4	345,2
Average kg/year <sub>2016-2017</sub>	<b>2485,50</b>	<b>599,40</b>	<b>71,00</b>	<b>96,80</b>	<b>339,20</b>
<b>%WHO <sub>2016-2017</sub></b>	<b>98,63</b>		<b>91,03</b>	<b>138,29</b>	<b>85,87</b>

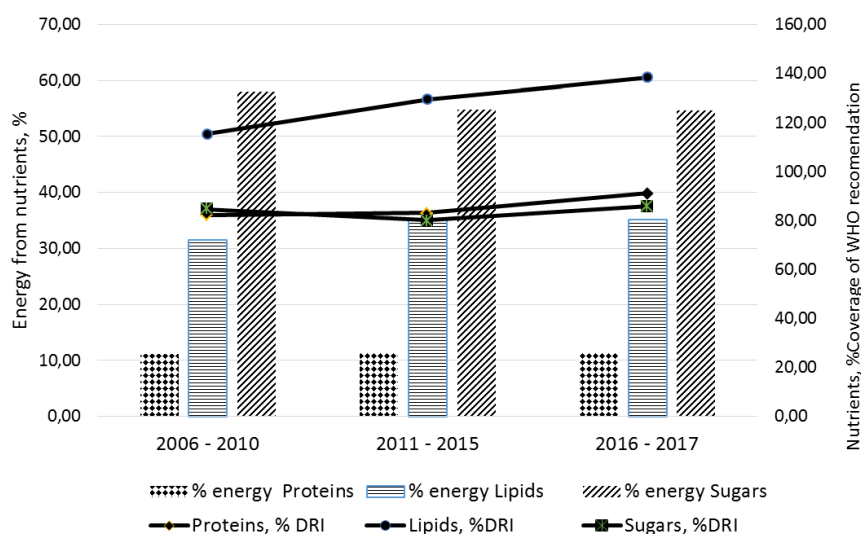
Source: Biroul National de Statistica

Lipid consumption has increased and this fact is also closely related to the increase of the consumption of meat, milk and dairy products.

According to WHO data, the highest level of fat consumption in the European region is found in the Baltic countries and Western Europe - 41% and 38% of the daily energy requirements [12, 13]. In Republic of Moldova the level of fat consumption in daily energy intake represents 35%, which is specific to these countries.

For sugars, consumption was relatively constant (around 316,0 g) until 2014, after which it started to increase reaching 345,2 g in 2017. It has to be mentioned that the increase in carbohydrate intake occurred due to the increase in consumption of vegetables, fruits and berries, but not from the cereals, especially bread account - the consumption of which has diminished. Compared to the nutritional intake values recommended by the World Health Organization (WHO), the composition of an average citizen's diet in the Republic of Moldova

includes adequate proportions of carbohydrates and proteins but contains a certain excess of fat.



**Figure 2.** Average nutritional intake in the Republic of Moldova contained %.

### Conclusion.

A comparative analysis of actual consumption and recommended rational norms of food consumption in the Republic of Moldova illustrates the insufficient provision of the inhabitants of the region with basic foodstuffs (vegetables and fruits, meat, dairy products). The main problem in the country is associated with inadequate consumption of dairy products - about 40%, vegetables - 60%, fruits - 50%, eggs - 70% compared with recommended amounts of food consumption. It was found that the consumption of food by the population is directly related to the food security of the country. Therefore, the state authorities of the Republic of Moldova should take into account the following areas of food security:

- Increasing the availability of all food products for all groups of the population;
- Improving product quality;
- Attracting additional investment in agriculture;
- Livestock development;
- Use of unused arable land.

Concerning the energy and nutritional compounds intake, compared to the nutritional intake values recommended by the World Health Organization (WHO), the composition of an average citizen's diet in the Republic of Moldova includes adequate proportions of carbohydrates and proteins but contains a certain excess of fat. Compared to the nutritional intake values recommended by the World Health Organization (WHO), the composition of an average citizen's diet in the Republic of Moldova includes adequate proportions of carbohydrates and proteins but contains a certain excess of fat. In 2013, the average nutritional intake in the Republic of Moldova contained 54% of carbohydrates, 35% of fats and 11% of protein.

In general, the average diet does not appear to have undergone any significant changes after 2006. In terms of food composition, Moldovan families have gradually reduced basic food consumption, maintained the level of meat and fish consumption and gradually increased product consumption dairy, fruit and vegetables, fats and oils.



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