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CONSIDERATIONS UPON THE TRENDS IN THE WOLRD SILK TRADE

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Abstract

The purpose of the paper was to analyze the dynamics of the world silk production, export, import and trade balance in the period 2012-2016 and to identify the trends and estimate the forecast for the horizon 2017-2021, based on the data supplied by ISC, ITC and UN COMTRADE and using the modern specific methods. The world silk production accounted for 192,692.45 Metric tonnes in the year 2016, being 1.26 times higher than in 2012. China and India produced 97.94 % of the world silk production. The most traded products worldwide are woven fabrics, raw silk on thrown, silk waste, silk yarn and yarn spun from silk waste, despite that it was registered a decline of the exported and imported quantities, because of the increased demand on the domestic markets of the main producers. The silk export value was USD 2,149 Million in 2016, by 31.49 % less than in 2012. The highest share in the world export value belong to woven fabrics, raw silk non thrown, silk yarn and yarn spun from silk waste, which together cumulated 95.77 %. The top silk exporters and China (53.9%), Italy (13.4 %), India (4.2 %), Romania (4 %), France (3.7 %), all together totalizing 79.2 % in the world silk export value. The world silk import value was USD 1,785 Million in 2016, by 29.21 % less than in 2012.The highest share in the world silk import value is kept by woven fabrics (56.13 %), raw silk non thrown (22.51%), and silk yarn (12.85%) which together totalize 91.49 %. The world top silk importers are: Italy (18.3 %), India (11.6%), Japan (7%), Romania (6.4 %), Vietnam (6.3 %), USA (5.7 %), France (4.4 %), Rep. Korea (3.9 %), Hong Kong China (3.3 %), China (3.2 %) and Germany (3%), all together accounting for 73.1 % of the world silk export value. The silk trade balance reached USD 354.3 Million in 2016, by 41.08 lees than in 2012. The main exporting and producing countries registered a negative trade balance, except China which had a positive balance. Silk price varied from a product to another, in relation to the demand/offer ratio. Woven fabrics, raw silk non thrown and silk yarn have the highest export price, while raw silk non thrown and silk yarn have the highest import price. In the horizon 2017-2021, it is expected as silk production to grow, but the export and import to decline due to the higher and higher requirement in the domestic markets of the producing countries.

Key words**:** *silk, world, production, trade, analysis, trends, forecast, export, import, trade balance*

INTRODUCTION

Silk is considered one of the most valuable natural textile fibers besides cotton and wool. Its roots are found more than 3,000 years ago in China and then in India, from where silkworm rearing was spread by means of the "silk road" to the Mediterranean area and then to Europe. From a standard for royalty and special gifts in the old times, nowadays silk is successfully used for producing luxury textiles and fabrics, but also has many other utilizations in medicine, aeronautics and automotive industry [17].

Silk demand is continuously increasing for producing fabrics and clothes so much desired to be worn both by women and men due to its special fineness, pleasant and delicate touch, resistance, unique shining and elegant appearance [2, 12].

Silk is a luxury natural fiber which can't be compared to synthetic fibers such as polyester and viscose which have become more and more used for textile and clothes due to their lower production cost [8, 9].

Also, silk is in competition with cotton which at present represents 90 % of the global natural fibers production, while silk represents only 0.2 %. This was caused by the extend of cotton production, the unbalanced demand/supply ratio, the fail of silk industry in Europe and the high growth rate of silk industry in China, the world leader in cotton and silk production which is able to produce with the lowest cost and sell at "dumping" prices.

The silk market continues to be in a strong competition with the market of super fine synthetic fibers and of other natural fibers whose quality has been substantially improved. After a long period when silk price was low, at present silk price has recovered being higher than USD 55/kg, stimulating the revival of silk cocoon and raw silk production in many countries [15].

Nowadays, silk is produced in more than 60 countries in the world, most of them being developing countries. The Asian area is in the top with 90 % of the world mulberry silk and 100 % of non mulberry silk production. A few other producers are in the Latin America, mainly Brazil, Africa mainly Egypt and Madagascar and in Europe only Bulgaria [5].

Silk industry is an important branch of agriculture and even of economy and an income source for rural population in some countries. The silkworm rearing and silk obtaining require simple operations which could be easily made by women and old people [7, 10].

Therefore, silk industry is a job supplier for millions of people preventing and limiting migration to cities. The business in silk industry needs just small investments and the marketed silk provides high return to the producers living in the rural areas of the developing countries. More than this, the increased demand in the international market contributed to the development of the silk trade assuring important currency inflows in the payment balance of the developing countries, In this way, equity from the major consumers, the developed countries, was transferred to the main suppliers, the developing counties.

In addition, silk industry involves production processes which are environment friendly, mulberry trees assure a green cover, soil conservation and erosion protection and allow the use of unsuitable land for crop cultivation. Silk production and processing is not polluting, the CO_2 emissions are very low and wastes could be easily degraded [11].

Sericiculture, followed by agro-forestry, organic farming, composting and beekeeping are the main activities offering "green jobs" able to assure sustainable development by means of the green economy [3].

Therefore, silk industry brings an important contribution to the sustainable development by increasing the living standard in the developing countries, reducing poverty, hungry, gender discrimination and risk of diseases [13].

In this context, the paper aimed to analyze the situation of silk market at the world level in order to identify the major trends in silk production, export and import quantities, export value, import value and trade balance, and silk price in the period 2012-2016 and to set up a forecast for the horizon 2017-2021.

MATERIALS AND METHODS

Data collection.

The study used the empirical data collected from International Sericiculture Commission, International Trade Center and UN COMTRADE for the period 2012-2016 [5, 6, 16]. Also various useful information was collected from various sources such as published articles in scientific journals and magazines, reports and websites.

In order to identify the trends in silk international trade, the following indicators were used:

-silk production, analyzed in its dynamics in the analyzed period;

-the main producers and consumers of silk in the world;

-the silk production achieved by the top producing countries in the world by producer:

-the quantity of exported silk products by product type at the world level;

-the quantity of imported silk products by product type at the world level;

-the silk export value at the world level;

- the silk import value at the world level;

-the silk export value at the world level by silk product type;

- the silk import value at the world level by silk product type;

- the share of each silk product type in the world silk export value;

- the share of each silk product type in the world silk import value;

-the share of various silk products in the silk export value;

-the share of various silk products in the silk import value;
-the trade balance by silk product;
-the silk export value in the top exporting countries in the world;
-the silk import value in the top importing countries in the world;
-the market share of the top silk exporting countries in the world silk export value;
-the market share of the top silk importing countries in the world silk import value;
-the trade balance for the top exporters and importers of silk in the world;
-the average export price of silk by silk products;
-the average import price of silk by silk products;
-the forecast for the world silk production;
-the forecast for the world silk export value;
-the forecast for the world silk import value;
-the forecast for the world silk trade balance.

The methods used in this study have been the following ones:

Index method, using the index with fixed basis, I_{FB}, determined by means of the formula: $I_{t/t0} = (Y_t/Y_0)100$. This was utilized for pointing out the evolution of each indicator in the analyzed period, comparing the level recorded in the last year 2016 with the level registered in the first year, 2012, considered term of reference.

The structure of export and import by type of silk product was determined dividing the export value (E_i) and respectively, the import value (I_i) belonging to type of silk product in the total value of silk export (E) or import (I), in percentage. The corresponding formula was: $S_{E\%}= (E_i/E)x\ 100$ for the share of export, and $S_{I\%}= (I_i/I)x\ 100$ for the share of import.

The descriptive statistics including: mean, standard deviation and variation coefficient were calculated for the silk export value, silk import value and trade balance at the world level.

The forecast for the horizon 2017-2021 was based on the average annual growth rate (%) or the average annual absolute change in the period 2012-2016 for the indicators mentioned above.

In this purpose, there were determined:

-*The absolute annual change* using the formula: $\Delta t/_{t-1}= Y_t - Y_{t-1}$

-*The indices with variable basis* using the formula: $I_{t/t-1} = (Y_t/Y_{t-1})100$

-*The annual growth rate (%), $R_{t/t-1}$* according to the formula: $R_{t/t-1} = [(Y_t/Y_{t-1})/(Y_{t-1})]100$

-*The forecast* was established using the formula: $Y_{t+1} = Y_t + \bar{\Delta}_{t/t-1,}$ where Y_{t+1} is each year of the forecast period, Y_t is the level of the indicator in the year 2016 and $\bar{\Delta}_{t/t-1}$ is the average annual absolute change of the indicator in the period 2012-2016.

In the study, all the results were illustrated either in graphics or tables accompanied by comments and interpretations. At the end, there were presented the main conclusions reflecting the main trends indentified for each analyzed indicator.

RESULTS AND DISCUSSIONS

The dynamics of the world silk production

The world silk production increased in the analyzed period from 20,837.5 Metric tonnes in 2007 to 192,692.45 Metric tonnes in the year 2016. This was the consequence of an increased demand for silk both for textiles and clothes industry, but also for other industries: aeronautics, electronics, medicine etc, both in the producing countries and in the international market (Fig.1.). Therefore, in this period, the world silk production increased 9.24 times.

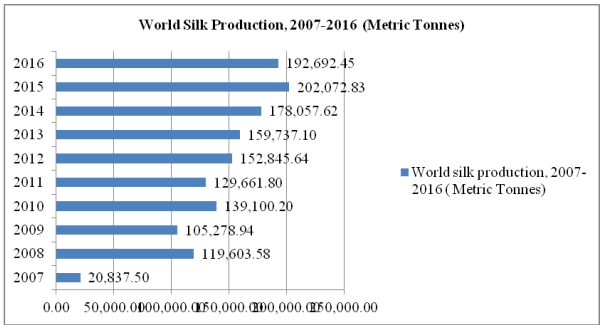

Fig. 1. The dynamics of the world silk production, 2007-2016 (Metric tonnes)

Source: Own design based on the data provided by ISC/Statistics/Production, 2012 and 2018, www.inserco.org, Accessed on January 20, 2018 [5].

The main silk producing countries are especially from Asia and just a few from the Latin America, Middle East, Africa and

Europe.

The top 12 producers in the world, in the descending order of silk production performed in the year 2016 and also in the previous years, are the following ones: China, India, Uzbekistan, Thailand, Brazil, Vietnam, North Korea, Philippines, Iran, Bangladesh, Japan and Bulgaria.

The market share of these countries in the world production in 2016 was: China 82.20 %, India 15.74 %, Uzbekistan 0.65 %, Thailand 0.36 %, Brazil 0.33 %, Vietnam 0.27 %, North Korea 0.19 %, Philippines 0.09 %, Iran 0.06 %, Bangladesh 0.02 %, Japan 0.02 % and Bulgaria 0.0046 %.

Therefore, the main silk producer in the world is China, followed by India, and the both countries together produced 97.94 % of the global silk production.

At the world level, silk production increased by only 38.52 % in the period 2010-2016. It was noticed a different trend in the dynamics of silk output in the main producing countries (Table 1).

Table 1.The world silk production in the top producing countries in the period 2010-2016, (Metric Tonnes)

	2010	2011	2012	2013	2014	2015	2016	2016/2010 %
1. China	115,000	104,000	126,000	130,000	146,000	170,000	158,400	137.73
2.India	21.005	23,060	23,679	26,480	28,708	28,523	30,348	144.47
3.Uzbekistan	940	940	940	980	1,100	1,200	1,255	133.51
4.Thailand	655	655	655	690	692	698	712	108.70
5.Brazil	770	558	614	550	560	600	650	84.41
6.Vietnam	550	500	450	475	420	450	523	94.05
7.North Korea	-	300	300	300	320	350	365	121.66
8.Philippines	1	1	0.89	1	1.1	1.2	182	182.00
9.Iran	75	120	123	123	110	120	125	166.66
10.Bangladesh	40	38	42.5	43	44.5	44	44	110.00
11.Japan	54	42	30	30	30	30	32	59.25
12.Bulgaria	9.4	6	8.5	8.5	8	8	9	95.70

Source: ISC, 2018, www.inserco.org, Accessed on January 20, 2018 [5].

Silk production registered the following growth rate in the analyzed period by country: +82.66 % in Philippines, +66.66 % in Iran, +44.47 % in India, +37.73 % in China, + 33.51 % in Uzbekistan, +21.66 % in North Korea, + 10 % in Bangladesh, +8.7 % in Thailand, while in other countries silk production declines as follows: Japan by -40.75 %, Brazil by -15.59 %, Vietnam by -4.95 % and Bulgaria by -4.30 %.

Besides the countries mentioned above, the Latin America is another pole of sericulture development for producing high quality raw silk mainly in Brazil, which is situated of the 5th position in the global silk production. Besides Brazil, Argentina, Bolivia, Colombia, Cuba, Ecuador, Mexico, Paraguay, Peru and Venezuela have developed sericiculture as an alternative for the economic development of the small farms [1].

The main silk consumers are USA, Italy, Japan, France, China, United Kingdom, Switzerland, Germany, United Arab Emirates, Korea and Vietnam [5].

USA is not a silk producer, but it is one of the largest silk importers and consumers of silk goods (garments, interior decoration fabrics and accessories). As silk has not the aura like in European countries, the USA is well known for "easy-care" fabrics, its main supplier being China.

Italy is one of the most important importer and processor of silk and also an exporter of silk products in Europe. It imports raw silk and silk yarn, but also blouses for ladies, silk garments. The Italian processing industry produce mainly high quality scarves and neckties, which are successfully exported.

France is also a silk importer, producer and exporter. It produces high quality silk fabrics, of which 70 % are used for clothing and the remaining for interior decorations (curtains, wall covers, bed spreads etc). Besides the domestic consumption, many of the French silk goods are sold mainly to the USA.

Japan is a producer, but also an importer and

major consumer of silk. Beside the local production of silk goods, Japan imports various silk products. About 50 % of its raw silk consumption is used for producing "kimonos".

Germany is one of the largest importers of silk for textile and clothing of the highest quality to meet the consumers' requirements. Its main suppliers are China, India and Thailand [14].

The main silk sorts which are object of international trade, according to the Harmonized System, HSN codes for GTS, 50 Silk have the following codes and meaning: HSN 5001- Silkworm cocoons, suitable for reeling, HSN 5002- Raw silk (non-thrown), HSN 5003- Silk waste (including cocoons unsuitable for reeling, yarn waste and garneted stock); HSN 5004- Silk yarn (excluding that spun from silk waste and that put up for retail sale); HSN 5005- Yarn spun from silk waste (excluding that put up for retail sale); HSN 5006- Silk yarn and yarn spun from silk wastes put up for retail sale, silkworm gut; HSN 5007- Woven fabrics of silk or of silk waste [4].

The world amount of exported silk products. The highest quantity of exported silk belongs to the Code 5002, Raw silk, non thrown, despite that it recorded a slight decline in the period 2012-2016 from 9,126 Tonnes in 2012 to 8,964 Tonnes in 2016.

On the 2nd position comes the Code 5003 - Silk waste, whose exported quantities increased by 15.35 % from 5,378 Tonnes in 2012 to 6,204 Tonnes in 2016.

On the 3rd position is the Code 5004 - Silk yarn which recorded 4,917 Tonnes in 2016 by about 18 % less than in 2013.

On the 4th position comes the silk product with the Code 5005-Yarn spun from silk waste whose exported amounts in the international markets deeply declined by -45.98 % from 5,986 Tonnes in 2012 to 3,235 Tonnes in 2016.

On the 5th position is situated the silk product with the Code 5006-Silk yarn and yarn spun from silk wastes whose exported amounts increased by 151.26 % from 476 Tonnes in 2012 to 1,196 Tonnes in 2016.

On the 6th position is the Code 5001-Silk worm cocoons for reeling whose exported quantity increased by 56.01 % from 291 Tonnes in 2013 to 454 Tonnes in 2016.

Finally, the Code 5007-Woven fabrics of silk and silk waste declined by 37.14 % in 2015 reaching only 15,421 Tonnes compared to 2012 when it accounted for 24,532 Tonnes.

Therefore, this category was object of the highest amounts exported in the analyzed period (Fig.2).

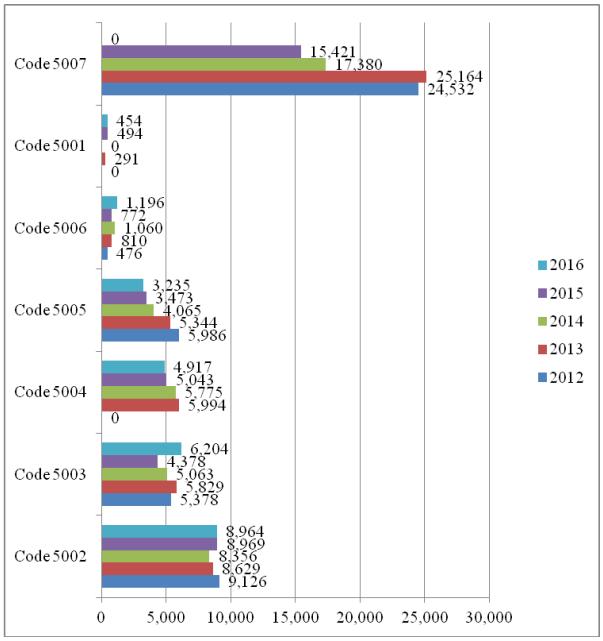

Fig. 2. The dynamics of the world exported silk quantities by HSN Codes, 2012-2016 (Tonnes)

Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The world amount of imported silk products. The Code 5002 is on the top position with 9,045 imported Tonnes in the year 2016, despite that it was by 4.77 % less than in 2013.

On the 2nd position comes the Code 5003 with 6,527 Tonnes imported in the year 2016, by 45.82 % more than in 2012 (4,476 Tonnes).

The Code 5004 accounted for 4,858 imported Tonnes in 2016, by 18 % less than in 2012 9 5,925 Tonnes).

The Code 5005 came on the 4th position for 3,458 Tonnes imported in 2016, but by 28.62 % less than in 2012 9 4,844 Tonnes).

The Code 5001 accounted for 594 Tonnes imported in 2016, by 34.08 % less than in 2012.

The Code 5006 also declined as its imported amount was 404 Tonnes in 2016, by 43.74 % lower than in 2012 (718 Tonnes).

Finally, the Code 5004 was imported only in the years 2013 and 2014, accounting for 57,026 Tonnes and, respectively for 62,883 Tonnes (Fig.3).

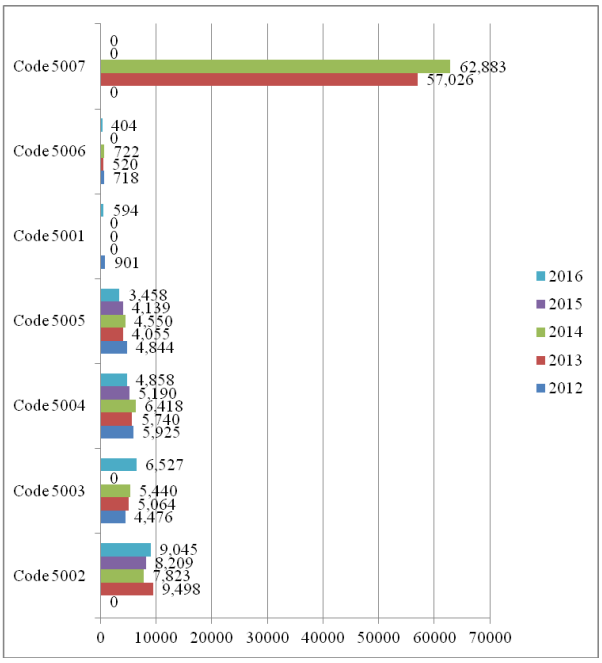

Fig. 3. The dynamics of the world imported silk quantities by HSN Codes, 2012-2016 (Tonnes)
Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The world silk export value accounted for USD 2,149,157 thousand in the year 2016 compared to USD 3,136,722 thousand in the year 2012.

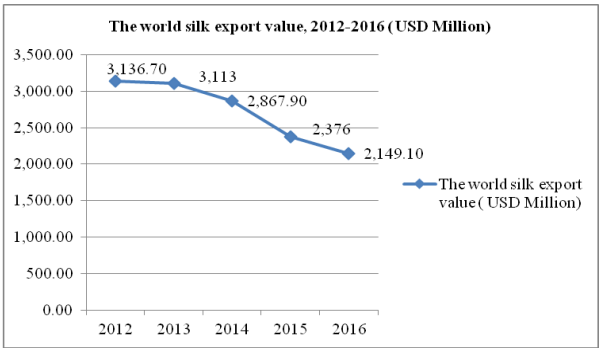

Fig. 4. The dynamics of the world silk export value, 2012-2016 (USD Thousand)
Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

This means a decline by 31.48 % in the analyzed period, as in 2016, the global silk export value represented 68.51 % of the level in 2012 (Fig.4.)

The world silk export value by silk product. On the 1st position in the Code 5007 Woven fabrics, whose export value accounted for USD 1,312,049 thousand in 2016, being by 39.18 % lower than in 2012.

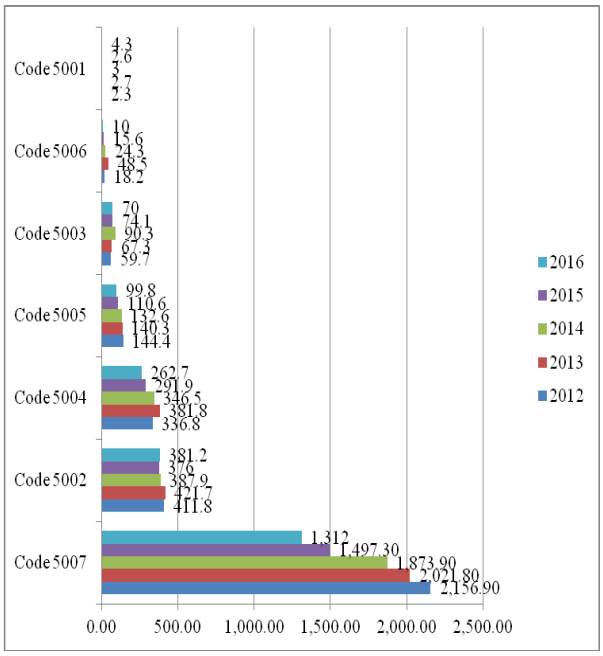

Fig. 5. The dynamics of the world silk export value by HSN Codes, 2012-2016 (USD Million)
Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

On the 2nd position, it is situated the Code 5002 Raw silk non-thrown, whose export value was USD 318,217 thousand in 2016, by 7.44 % lower than in 2012.

On the 3rd position, it was the Code 5004 Silk yarn, with an export value of USD 262,739 thousand in 2016, being by 22 % lower than in 2012.

On the 4th position came the Code 5005 Yarn spun from silk waste with USD 99,868 thousand export value, by 30.88% lower than in 2012.

On the 5th position, it was situated the Code 5003 Silk waste (unreeling cocoons and yarn waste) which recorded USD 70,020 thousand export value in 2016, by 17.19 % more than in 2012.

On the 6th position, it was situated the Code 5006 Silk yarn and yarn spun from silk wastes, whose export value accounted for USD 10,009 thousand in 2016, by 45 % less

than in 2012.
On the 7th position it was the Code 5001 Woven fabrics with the lowest export value accounting for USD 4,390 thousand in 2016, by 84.9 % more than in 2012.
Therefore, the general trend of the export value was a decreasing one for the silk products with the Codes: 5007,5002,5004,5005 and 5006, but an increasing trend for the codes 5003 and 5001 (Fig.5).

The share of various silk products in the world silk export value was the following one in the year 2016: 61.03 % Code 5007, 17.81 % Code 5002, 12.27 % Code 5004, 4.66 % Code 5005, 3.27 % Code 5003, 0.76 % Code 5006 and 0.20 % Code 5001 (Table 2).

Table 2. The share of the silk products by their HSN Codes in the world silk export and import value in the year 2016 compared to 2012 (%)

Code of silk product	The share in the world export value (%)		The share in the world import value (%)	
	2012	2016	2012	2016
5007	68.90	61.03	63.13	56.13
5002	13.15	17.81	18.64	22.51
5004	10.76	12.27	12.16	12.85
5005	4.61	4.66	3.31	3.95
5003	1.91	3.27	2.06	3.78
5006	0.58	0.76	0.58	0.61
5001	0.09	0.20	0.12	0.17

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The world top silk exporters are presented in Fig.6.

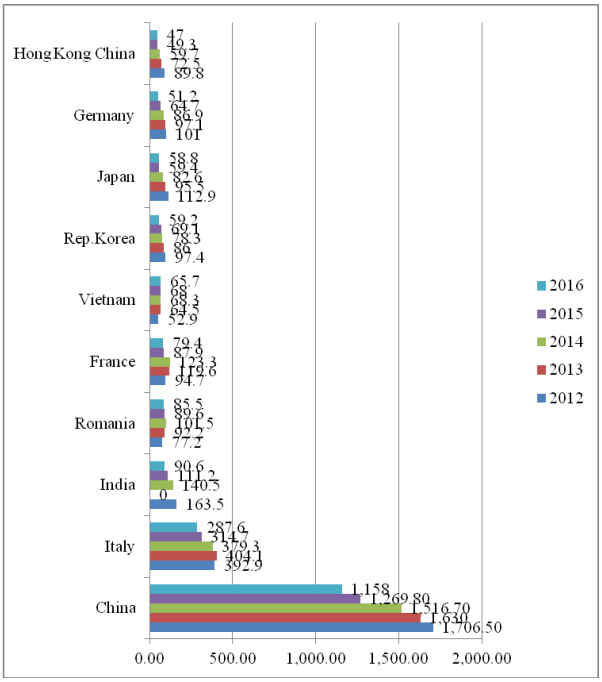

Fig. 6. The dynamics of the world silk export value by main exporting countries, 2012-2016 (USD Million)
Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

In the descending order, are: China, Italy, India, Romania, France, Vietnam, Republic of Korea, Japan, Germany and Hong Kong-China, all together exporting silk of USD 1,983,473 thousand in 2016, representing 92.26 % of the world silk export value.
Compared to the total silk export value registered by these 10 producers in the year 2012, which accounted for USD 2,889,314 thousand, in 2016 their silk export value represented 68.64 % of that value, reflecting the decline of silk export worldwide (Fig.6).
In the period 2012-2016, almost all the silk exporters registered a decline of the export value which accounted for: China -36.15 %, Italy -16.81 %, India -44.55 %, France -16.16 %, Rep. Korea -39.17 %, Japan -47.94 %, Germany -49.30 % and Hong Kong China -47.69 %.
The only exceptions are Romania, whose silk export value increased by 10.81 % and Vietnam, whose export value increased by 24.11 % in the period 2012-2016.

The market share of the top 10 silk exporters in the global silk export value was the following one in 2016: China 53.9 %, Italy 13.4 %, India 4.2 %, Romania 4 %, France 3.7 %, Vietnam 3.1 %, Rep. Korea 2.8 %, Japan 2.7 %, Germany 2.4 % and Hong Kong China 2.2 % (Table 3).

Table 3. The dynamics of the market share of the top exporters in the world silk export value and the market share of the top importers in the world silk import value in the year 2016 (%)

Country	Market share in the world silk export value (%)	Country	Market share in the world silk import value (%)
World Silk export value (USD Thousand)	2,149,657	World Silk import value (USD Thousand)	1,794,815
China	53.9	Italy	18.3
Italy	13.4	India	11.6
India	4.2	Japan	7.0
Romania	4.0	Romania	6.4
France	3.7	Vietnam	6.3
Vietnam	3.1	USA	5.7
Rep. Korea	2.8	France	4.4
Japan	2.7	Rep. Korea	3.9
Germany	2.4	Hong Kong China	3.3
Hong Kong China	2.2	China	3.2
		Germany	3.0

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The world silk import value followed a similar descending trend like the global silk export value. In 2016, the world silk import value was USD 1,794,815 thousand compared to USD 2,535,352 thousand in the year 2012. This means that it registered a decline of 29.21 % in the analyzed period, in the year 2016, the silk import value representing 70.79 % of the level recorded in 2012 (Fig.7).

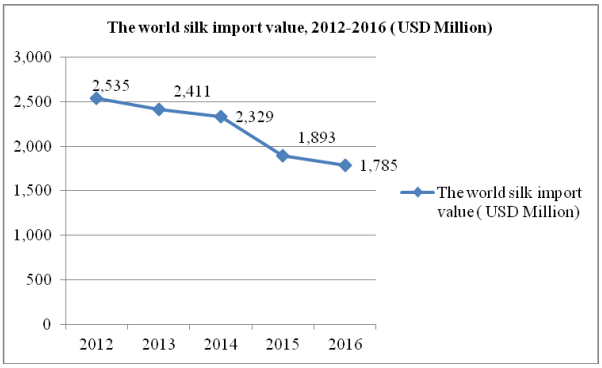

Fig. 7. The dynamics of the world silk import value, 2012-2016 (USD Thousand)
Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The world silk import value by silk product.

On the top position it is the products with the Code 5007 Woven fabrics with USD 1,000,991 thousand import value in 2016, by 37.08 % less than in 2012.

On the 2nd position, it is the Code 5002 Raw silk non thrown, whose import value accounted for USD 401,457 thousand in 2016, being by 14.48 % lower than in 2012.

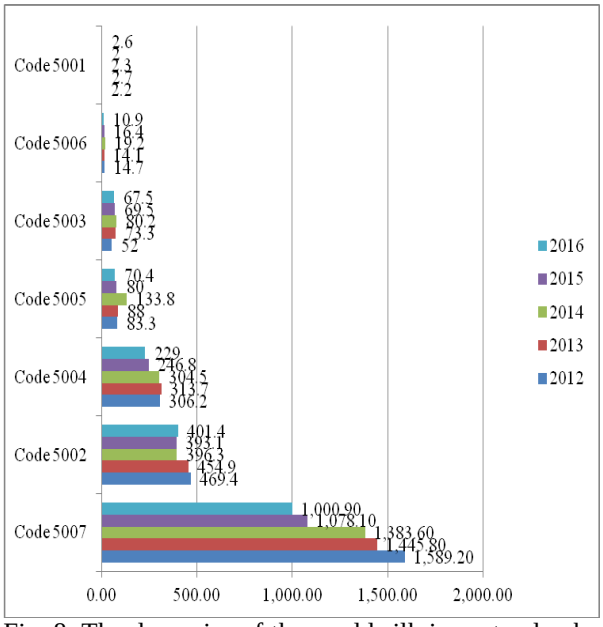

Fig. 8. The dynamics of the world silk import value by HSN Codes, 2012-2016 (USD Million)
Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

On the 3rd position came the Code 5004 Silk yarn, whose import value accounted for USD 229,098 thousand in 2016, being by 25.20 % lower than in 2012.

On the 4th position it was situated the Code 5005 Yarn spun with USD 70,471 thousand import value, by 15.46 % less than in 2012.

On the 5th position it was the Code 5003 with USD 67,515 thousand import value, by 29.61 % higher than in 2012.

On the 6th position, it was placed the CODE 5006 Silk yarn and yarn spun from silk wastes with USD 10,979 thousand import value in

2016, being by 25.80 % less than in 2012.
Finally, on the 7th position it was situated the Code 5001 Silk cocoons with USD 2,658 import value being by 16.83 % higher than in 2012.
Therefore, the general trend of the silk import value was a decreasing one for the silk products with the Codes: 5007, 5002, 5004, 5005 and 5006, but an ascending one for the Codes 5003 and 5001, like in case of the export value (Fig.8).
The share of various silk products in the silk import value was the following one in the year 2016: 56.13 % Code 5007, 22.51 % Code 5002, 12.85 % Code 5004, 3.95 % Code 5005, 3.78 % Code 5003, 0.61 % Code 5006 and 0.17 % Code 5001 (Table 2).
The world top silk importers, in the decreasing order are: Italy, India, Japan, Romania, Vietnam, USA, France, Rep. Korea, Hong Kong China and Germany (Fig.9).

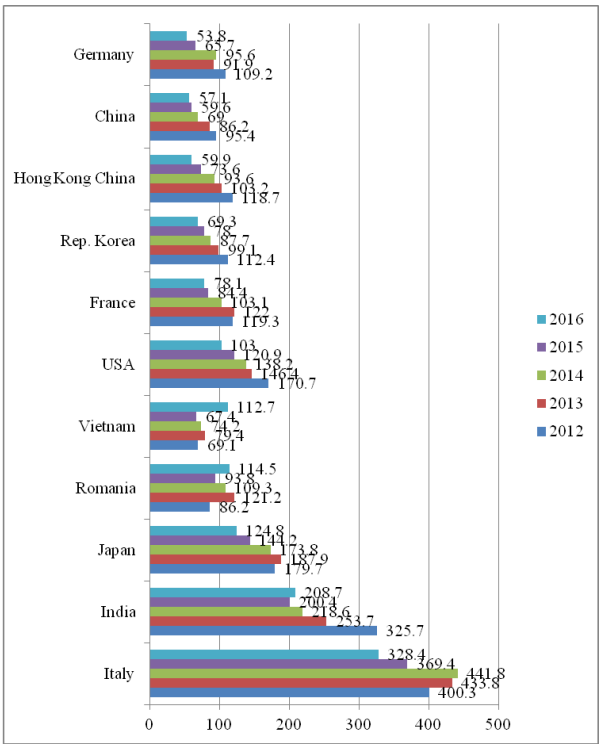

Fig. 9. The dynamics of the world silk import value by main importing countries, 2012-2016 (USD Million)
Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

All these 11 countries registered USD 1,310,756 thousand silk import value in the year 2016, representing 73.03 % of the world silk import value. In 2012, the import value of these countries accounted for USD 1,787,234 thousand. Therefore, in 2016, their silk import value was only 73.33 % of the level of the year 2012. The silk import value registered a decline (Fig.9).
The decrease of the silk import value in the year 2016 was the following one by importing country: Italy -17.97 %, India -35.91 %, Japan -30.56 %, USA -39.68, France -34.56 %, Rep. Korea -38.37 %, Hong Kong China -49.54 %, China -40.12 % and Germany -50.66 %.
Romania and Vietnam are the only main importing countries whose silk import value increased in the year 2016 compared to 2012, in case of Romania by + 32.86 % and in case of Vietnam by 63 %.
The market share of the top 11 silk importing countries in the world silk import value for the year 2016 is presented in Table 3. The weight in the decreasing order was the following one: Italy 18.3 %, India 11.6 %, Japan 7 %, Romania 6.4 %, Vietnam 6.3 %, USA 5.7 %, France 4.4 %, Rep. Korea 3.9 %, Hong Kong China 3.3 %, China 3.2. % and Germany 3 %. All these 11 countries accounted for 73.1 % in the world silk import value in the year 2016 (Table 3).
The world silk trade balance had a descending evolution taking into account the decreasing trend both of the export and import value. In 2016, the global silk trade balance accounted for USD 354,342 thousand compared to USD 601,370 Thousand in the year 2012. Therefore, in the last year of the analyzed period, the silk trade balance was by 41.08 % lower than in 2012 (Fig.10).

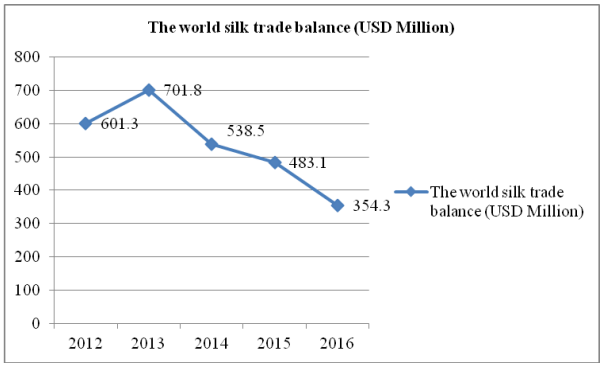

Fig. 10. The dynamics of the world silk trade balance, 2012-2016 (USD Million)
Source: Own design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The world silk trade balance by silk product is presented in Table 4. The figures from this table show that the silk products Cod 5007 Woven fabrics, 5004 Silk yarn, 5003 Silk waste, 5001-Silk cocoons had a positive value, meaning that the export value was higher than the import value in all the analyzed years in the period 2012-2016.

In case of the Code 5005 Yarn spun from silk waste, the trade balance was in general a positive one in almost all the years, except the year 2014, when it was registered a deficit.

In case of the Code 5006 Silk yarn and yarn spun from silk wastes, in the period 2012-2014 the trade balance was a positive one, while in the last two years 2015 and 2016 it was a negative one.

Finally, the only product with a negative balance in all the analyzed years was the Code 5002 Raw silk non thrown, meaning that its import value was higher than its export value.

In 2016, taking into account the dynamics ex the export and import values, the trade balance registered a descending trend in case of the Code 5007 (-45.21 %), Code 5005 (-51.93%), Code 5003 (-67.21%), Code 5006 (-28.48 %), an increasing trend in case of the Code 5004 (+10.02 %), the Code 5001 (17.67 times higher in 2016 compared to 2012) and the Code 5002 (+35.15 %), despite that in 2012 it was a deficit (Table 4).

Table 4. The dynamics of the world silk trade balance by silk product Codes, 2012-2016 (USD Thousand)

	2012	2013	2014	2015	2016	2016/2012 %
5007	567,637	576,033	490,324	419,166	311,058	54.79
5004	30,575	68,020	41,937	45,172	33,641	110.02
5005	61,150	52,270	-1,223	30,681	29,397	48.07
5003	7,669	13,991	10,044	4,616	2,515	32.79
5001	98	39	641	563	1,732	1,767.34
5006	3,405	34,344	5,107	-795	-970	-128.48
5002	-57,578	-43,175	-8,420	-17,130	-20,240	35.15

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The silk trade balance for the top exporters and importers in the world. The silk trade balance was a positive one only in case of China, which is the main silk producer and exporter which dominates the international market. Its trade balance accounted for USD 1,000,862 thousand in the year 2016, being by 31.67 5 lower than in 2012.

Almost all the other "players" in the silk international trade registered a negative trade balance in almost all the years from the studied period 2012-2016. The exceptions were represented by France, which registered a positive trade balance in 2014, 2015 and 2016, Vietnam with a positive trade balance in the year 2015 and Germany with a positive trade balance in the year 2013.

Compared to the year 2012, in 2016, the silk trade balance registered a lower positive value in case of China (68.33 %).

Table 5. The dynamics of the silk trade balance in the top exporting and importing countries in the world, 2012-2016 (USD Thousand)

	2012	2013	2014	2015	2016	2016/2012 %
China	1,611,094	1,543,720	1,447,621	1,210,225	1,100,862	68.33
Italy	-7,364	-29,674	-62,452	-54,713	-40,785	553.84
India	-162,244	-71,450	-78,104	-89,204	-118,113	72.79
Romania	-9,011	-29,097	-7,843	-4,278	-28,994	321.76
France	-24,559	-2,466	20,294	3,446	1,365	-5.55
Vietnam	-16,180	-14,889	-5,896	631	-46,082	290.37
Rep Korea	-15,034	-13,059	-9,530	-8,920	-10,041	66.78
Japan	-66,776	-92,436	-91,137	-84,771	-66,001	98.83
Germany	-8,201	5,142	-8,662	-911	-2,678	32.65
Hong Kong China	-28,892	-30,699	-33,863	-24,324	-12,910	44.68
TOTAL	1,272,833	1,265,M092	1,170,428	947,181	775,723	60.94

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The deficit of the trade balance was 5.53 times diminished in Italy, but in Romania increased 3.21 times and in Vietnam 2.90 times.

In 2016 compared to 2012, India registered a lower deficit by 27.21 %, Rep. Korea by 33.22 %, Japan by 1.17 %, Germany by 67.35 % and Hong Kong China by 55.32 %.

France registered a positive trade balance which was 17.99 times higher in 2016 compared to 2012 when it was a negative one.

Taking into account the trade balances of all these top 11 exporting and importing countries, their cumulated trade balance was a positive one in all the studied years and accounted for USD 775,723 thousand in 2016, being by 39.16 % lower than in 2012 (Table 5).

The dynamics of silk export price (FOB) by silk product is presented in Table 6. The figures show that the silk export price is the highest in case of the Code 5007 Woven fabrics, ranging between USD 87 and 108 per kg. On the 2nd position is the CODE 5004 Silk yarn whose export price ranged between USD 53 and 64 per kg. For the Code 5002 Raw silk non thrown the export price varied between USD 41-48 per kg, for the Code 5006 Silk yarn it varied between USD 8 and 38 per kg, for the Code 5003 Silk waste the export price ranged between USD 11 and 17.8 per kg and for the Code 5001 Silk cocoons it varied between USD 5.3 and 9.6 per kg.

In the analyzed period, the silk price declined in case of the Code 5007 (-5.77 %), Code 5002 (-5.77%), Code 5004 (-16.11 %), Code 5006 (-78.14 %), but it increased in case of the Code 5005 (+27.93 %), Code 5003 (+1.53 %) and Code 5001 (+2.98%).(Table 6).

Table 6.The dynamics of the world silk export price (FOB), 2012-2016 (USD/kg)

	2012	2013	2014	2015	2016	2016/2012 %
Code 5007	87.92	80.34	107.82	97.09	No data	94.23
Code 5002	45.12	48.17	46.42	41.92	42.52	94.23
Code 5004	No data	63.69	60.00	57.89	53.43	83.89
Code 5005	24.13	26.26	32.62	31.86	30.87	127.93
Code 5003	11.11	14.97	17.84	16.94	11.28	101.53
Code 5006	38.23	59.87	23.00	20.26	8.36	21.86
Code 5001	No data	9.38	No data	5.31	9.66	102.98

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The dynamics of silk import price (CIF) by silk product is presented in Table 7. In the analyzed period, the price silk import price registered a visible decline in case of the Code 5007 (-13.22 %), Code 5002 (-9.34%), Code 5004 (-8.79%), and Code 5003 (-11.10 %), but a growth in case of the Code 5005 (+18.36%), Code 5006 (+31.89%) and Code 5001 (+77.38).

The price varied between the following minimum and maximum values: Code 5007 USD 22-25.3 per kg, Code 5002 USD 44.3-50.6 per kg, Code 5004 USD 47.1-54.6 per kg, Code 5005 USD 17.2-29.4 per kg, Code 5003 USD 10.3-14.7 per kg, Code 5006 USD 20.6-27.2 per kg and Code 5001 USD 2.6-4.4 per kg (Table 7).

Table 7.The dynamics of the world silk import price (CIF), 2012-2016 (USD/kg)

	2012	2013	2014	2015	2016	2016/2012 %
Code 5007	No data	25.35	22.00	No data	No data	86.78
Code 5002	No data	48.95	50.66	47.89	44.38	90.66
Code 5004	51.69	54.66	47.45	47.55	47.15	91.21
Code 5005	17.21	21.72	29.41	19.32	20.37	118.36
Code 5003	11.63	14.47	14.75	No data	10.34	88.90
Code 5006	20.60	27.72	26.69	No data	27.17	131.89
Code 5001	2.52	No data	No data	No data	4.47	177.38

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The variations of the silk prices were determined by the change in demand/offer ratio at international level.

The descriptive statistics in terms of mean, standard deviation and coefficient of variation is presented for the following indicators: world silk production, world silk export value, world silk import value and world silk trade balance in Table 8.

Table 8. The descriptive statistics in terms of mean, standard deviation and coefficient of variation for the main indicators, 2012-2016

	MU	Mean	St.Dev.	Coeff. of variation (%)
World silk production	Metric Tonnes	177,081.12	20,960.83	11.83
World silk export value	USD Million	2,728.54	445.49	16.32
World silk import value	USD Million	2,190.7	331.66	15.13
World silk trade balance	USD Million	535.8	129.97	24.25

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The forecast of the world silk production for the horizon 2017-2021. In the period 2012-2016, the total absolute change of the world silk production accounted for 39,846.81 Metric tonnes, meaning an average absolute change of 9,961.70 metric tonnes per year.

Table 9.The forecast of the world silk production for the horizon 2017-2021 (Metric tonnes)

Year	World silk production (Metric tonnes)	Absolute change $\Delta t/_{t-1}$	Indices (%) $I_t/_{t-1}$	Growth rate (%) $R_t/_{t-1}$	Forecast 2017-2021	
					Year	Metric tonnes
2012	152,845.64	-	100.00	-	2017	202,654.15
2013	159,737.10	6,891.46	104.50	4.50	2018	212,615.85
2014	178,057.62	18,320.52	111.46	11.46	2019	222,577.55
2015	202,072.83	24,015.21	113.48	13.48	2020	232,539.25
2016	192,692.45	-9,380.38	95.35	-4.65	2021	242,500.95
Total		39,846.81		24.79		
Annual average		9,961.70		6,1975		
Annual average for 1 % growth		1,607.3739 Metric tonnes		1%		

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

Therefore, the average annual growth rate in the analyzed period was 6.1975 % (Table 9).

Taking into account the world silk production achieved in the year 2016 and the average annual absolute change registered in the period 2012-2016, it was estimated the world silk production for the horizon 2017-2021.

For 1 % annual growth rate, the world silk production will increase by 1,607.3739 Metric tonnes (Table 9).

In 2021, the world silk production is expected to reach 242,500.95 Metric tonnes by 35.84 % more than in 2016.

The forecast of the world silk production is also illustrated in Fig.11.

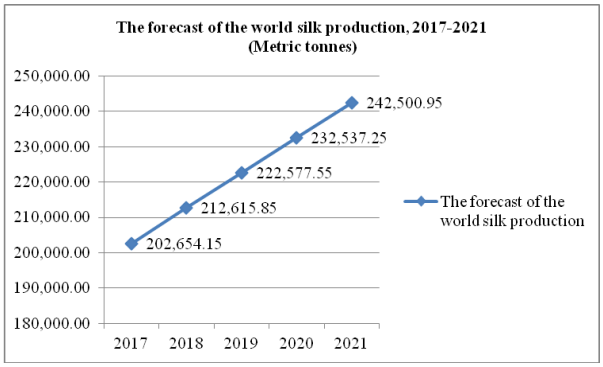

Fig. 11. The forecast of the world silk production for the horizon 2017-2021 (Metric tonnes)

Source: Own calculations and design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The forecast of the world silk export value. In the period 2012-2016, the world silk export value registered a total absolute change of -

USD 987.6 million, meaning an average absolute change of -USD 246.9 million per year. Therefore, the average annual decline rate in the analyzed period was -8.8375 %. Under these conditions and considering that the world silk export value will follow the same annual growth/decline rate in the next five years, it was established the forecast for the horizon 2017-2021 as presented in Table 10.

Table 10.The forecast of the world silk export value for the horizon 2017-2021 (USD Million)

Year	World silk export value (USD Million)	Absolute change $\Delta t/_{t-1}$	Indices (%) $I_t/_{t-1}$	Growth rate (%) $R_t/_{t-1}$	Forecast 2017-2021	
					Year	USD Million
2012	3,136.7	-	100.00	-	2017	1,902.2
2013	3,113	-23.7	99.24	-0.76	2018	1,635.3
2014	2,867.9	-245.1	92.12	-7.88	2019	1,408.4
2015	2,376	-491.9	82.84	-17.16	2020	1,161.5
2016	2,147.1	-226.9	90.45	-9.55	2021	914.6
Total		-987.6		-35.35		
Annual average		-246.9		-8.8375		
Annual average for 1 % growth		-27.937765 USD Million		-1%		

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

Therefore, it was estimated as the world silk export value to account for USD 914.6 million in the year 2021.
The forecast of the world silk production is also illustrated in Fig.12.

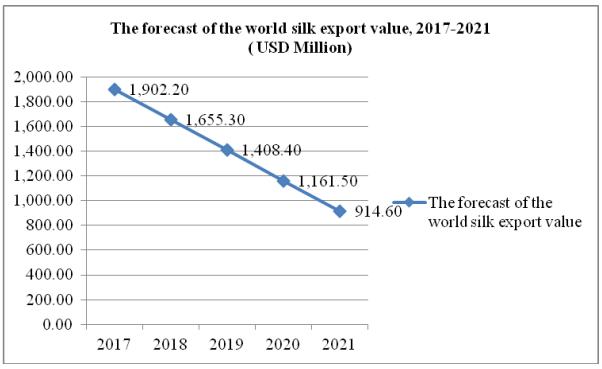

Fig. 12. The forecast of the world silk export value for the horizon 2017-2021 (USD Million)
Source: Own calculations and design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The forecast of the world silk import value.
In the period 2012-2016, the world silk import value registered a total absolute decline of - USD 187.5 million, meaning an average absolute decrease of - USD 22.900763 million per year.
Therefore, the average decrease rate in the analyzed period was -8.1875 %.
For the next five years, it was considered that the world silk import value will continue its decline with a similar average decrease rate. In Table 11, it is presented the forecast of the world silk import value for the horizon 2017-2021.
For 1 % decline, the world silk import value will decrease by USD 22.900763 Million every year (Table 11).
Therefore, it was estimated as the world silk import value to account for USD 847.5 million in the year 2021.
The forecast of the world silk production is also illustrated in Fig.13.

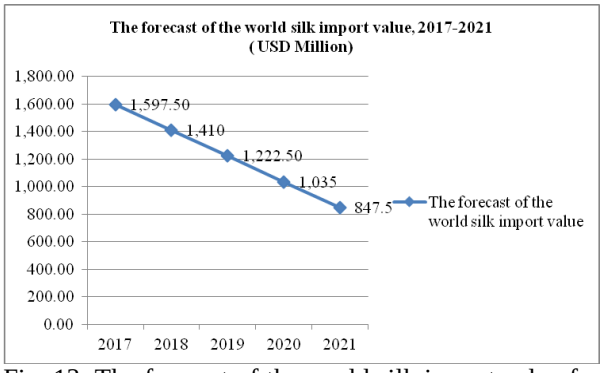

Fig. 13. The forecast of the world silk import value for the horizon 2017-2021 (USD Million)
Source: Own calculations and design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

Table 11.The forecast of the world silk export value for the horizon 2017-2021 (USD Million)

Year	World silk export value (USD Million)	Absolute change $\Delta t/_{t-1}$	Indices (%) $I_t/_{t-1}$	Growth rate (%) $R_t/_{t-1}$	Forecast 2017-2021	
					Year	USD Million
2012	2,535	-	100.00	-	2017	1,597.5
2013	2,411	-124	95.10	-4.90	2018	1,410.0
2014	2,329	-82	96.59	-3.41	2019	1,222.5
2015	1,893	-436	81.27	-18.73	2020	1,035.0
2016	1,785	-108	94.29	-5.71	2021	847.5
Total		-750		-32.75		
Annual average		-187.5		-8.1875		
Annual average for 1 % growth		-22.900763 USD Million		-1%		

Source: Own calculations based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

The forecast of the world silk trade balance. Taking into account the estimates for the world silk export and import value for the horizon 2017-2021, the world silk trade balance is expected to reach USD 67.1 million in the year 2021. This means that in the period 2017-2021, the silk trade balance will continue its decline keeping its positive value, but in 2021, it will be by 81.07 % lower than in 2016 (Fig.14).

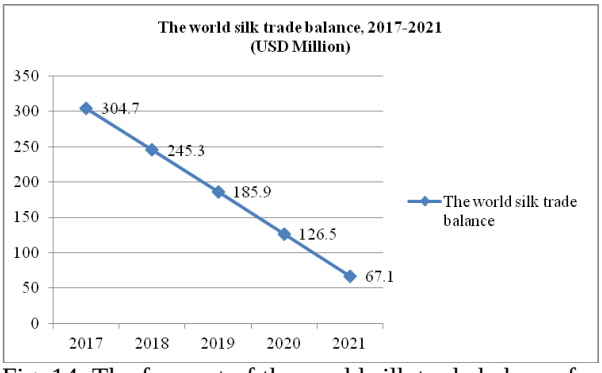

Fig. 14. The forecast of the world silk trade balance for the horizon 2017-2021 (USD Million)
Source: Own calculations and design based on the data provided by ITC, 2018, UN COMTRADE, 2018 [6, 16].

CONCLUSIONS

The world silk production increased 9.24 times in 2016 compared to 2007 and 1.26 times compared to 2012. In 2016, it accounted for 192,692.45 Metric tonnes.
The main silk producers are China and India which together produced 188,748 Metric tonnes silk in 2016, representing 97.94 % of the world silk production. Their production was by 38.27 % higher in 2016 than in 2012. This is explain by the fact that the internal market requires more silk for various purposes and also these two countries are the main silk suppliers for other countries.
Other silk producing countries with lower shares are, in the decreasing order: Uzbekistan, Thailand, Brazil, Vietnam, North Korea, Philippines, Iran, Bangladesh and Japan and also Bulgaria.
Silk products achieved and commercialized at the world level, are classified in seven categories according to the HSN codes for GTS. Taking into account the exported quantities of each silk product, the decreasing order of the product Codes are the following one in the year 2016: Code 5002, Raw silk, non thrown (8,964 Tonnes), Code 5003 -Silk waste (6,204 Tonnes), Code 5004 - Silk yarn (4,917 Tonnes), Code 5005-Yarn spun from silk waste (3,235 Tonnes), Code 5006-Silk yarn and yarn spun from silk wastes (1,196 Tonnes), Code 5001-Silk worm cocoons for reeling (454 Tonnes) and Code 5007-Woven fabrics of silk and silk waste (15,421 Tonnes).
The world amount of imported silk products in 2016 by silk product codes was the following one, in the decreasing order: Code 5002 (9,045 Tonnes), Code 5003 (6,527 Tonnes), Code 5004 (4,858 Tonnes), Code 5005 (3,458 Tonnes), Code 5001 (594 Tonnes), Code 5006 (404 Tonnes), Code 5004.

Therefore, the most commercialized silk products at the international level are, in the decreasing order, the following ones: woven fabrics, raw silk on thrown, silk waste, silk yarn and yarn spun from silk waste. All these products have recorded a general trend of decline of the exported and imported quantities in the period 2012-2014.

The silk export value also declined by 31.49 % in the analyzed period, accounting for USD 2,149 Million in 2016. The highest export value was registered by woven fabrics (61.03 %), raw silk non thrown (17.81%), silk yarn (12.27%) and yarn spun from silk waste (4.66 %), which all together represented 95.77 % of the world silk export value. All the products recorded a general descending trend of their export value.

The top silk exporters and China (53.9%), Italy (13.4 %), India (4.2 %), Romania (4 %), France (3.7 %), which all together have a market share of 79.2 % in the world silk export value.

The world silk import value also declined by 29.21 % in the analyzed period, accounting for USD 1,785 Million in 2016. The silk products with the highest share in the silk import value worldwide are: woven fabrics (56.13 %), raw silk non thrown (22.51%), and silk yarn (12.85%) which together totalize 91.49 %. The world top silk importers are: Italy (18.3 %), India (11.6%), Japan (7%), Romania (6.4 %), Vietnam (6.3 %), USA (5.7 %), France (4.4 %), Rep. Korea (3.9 %), Hong Kong China (3.3 %), China (3.2 %) and Germany (3%), all together accounting for 73.1 % of the world silk export value.

The silk trade balance followed also a descending trade reaching USD 354.3 Million in 2016, by 41.08 lees than in 2012. Almost all the main exporting and producing countries registered a negative trade balance, except China which had a positive trade balance in every year and France, which recorded a positive trade balance in 2014-2016.

Silk price varies depending on the demand/offer ratio for each type of silk product. The highest export price is for woven fabrics, raw silk non thrown and silk yarn and the highest import price is for raw silk non thrown and silk yarn. The silk export price registered a slight decline for woven fabrics, raw silk and silk yarn while for all the other products it increased. The import price declined for woven fabrics, raw silk, silk yarn and silk waste while for all the other products it increased.

For the next five years, 2017-2021 it is expected as silk production to continue to increase, but the export and import quantities and values and the trade balance to continue their decline due to the higher and higher consumption requirement in the domestic markets of the producing countries.

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