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CONSIDERATIONS ON COVID 19 IMPACT ON AGRICULTURE AND FOOD SECURITY AND FORWARD-LOOKING STATEMENTS

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Abstract

The COVID 19 pandemic is one of the greatest threats of the 21st century that disturbed whole human`s life and all sectors of the global economy. Due to highly infectious and spreading capacity of SARS-CoV-2 the governments took unprecedented measures worldwide with a great impact on the most vulnerable groups (people affected by chronically hunger, malnourished children and small farmers) and sectors. Agriculture is the most important economic sector that cares the responsibility for food security and human development. The present paper identifies and synthetize relevant literature to provide an integrated overview of the current state-of-knowledge on the economic impact of COVID 19 pandemic on agriculture and food security, including also forward-looking statements on future measures to mitigate the effects on crop production, food demand, agricultural products supply, inputs supply, agricultural products market, farmers` income and rural poverty. The study emphasizes that due to the mobility restrictions, decline in international trade, reduced purchasing power, disturbance in food production and food processing, food insecurity may arise affecting especially the small farmers from the regions already affected by poverty, climate change and conflicts. Therefore, the governments and international organizations should enforce the measures to control the pandemic, with minimum economic losses, without disturbing the food supply chain and re-enforcing the food security of their citizens.

Key words**:** *agriculture, COVID 19, food security, impact, SARS-CoV-2*

INTRODUCTION

As long as plants, animals and humans coexist on Earth, epidemics and pandemics will occur and lead to significant economic losses. World globalization, trade liberalization, international transport of people and commodities, working and studying mobilities across the world are factors that may contribute to pathogens spreading from one place to another, increasing epidemics and pandemics risks.

In plants the organisms with epidemic risk (pathogens, pest and invasive alien plants) are listed starting with early 1970s on the "black" list of specialized international organizations, such as FAO, European and Mediterranean Plant Protection Organization (EPPO A1 List and EPPO A2 List), whose mission is to help countries in preventing the introduction of harmful organisms from different parts of the world and to avoid their spreading in new areas and territories, in order to limit economic losses. These losses can be generated by surveillance, control and eradication, losses of yield, income and employment and losses of trade access [1, 3,11,15,14]. Thus, to evaluate the epidemic potential risk of emerging pests to agriculture, forestry and the environment, EPPO is involved in Pest Risk Analysis (PRA) in order to propose immediately phytosanitary measures to mitigate these risks.

On the other side plant pathogens, pests and weeds are one of the most important drivers of the diversity in plant breeding, new crop management and practices, new methods and

technologies in agriculture and food research and production [4, 5, 6, 7,13, 34, 35, 36].

However, an outbreak of any pest or disease, either plant or animal, has the potential to be widespread in large territories, with subsequent social, economic and environmental impacts.

Beside globally or regional economic impact generated by plants and animals' pathogens, during the time, many human diseases have had their own effects on global economy. For example, the Ebola outbreak occurred in 2015, which affected Guinea, Liberia and Sierra Leone in Western Africa region, resulted in more than $ 500 billion losses [24].

During its history the humankind has been faced different diseases, such as tuberculosis, malaria, leprosy, cholera, smallpox, influenza, Russian flu, Spanish flu, Asian flu, HIV/AIDS, H1N1, Ebola, Zika, MERS, SARS. These diseases have affected humans worldwide by their contagious and often deadly capacity leading to epidemics or even pandemics which have disturbed whole human`s life and global working productivity. [25, 26, 39].

According with [31] a disease is not a pandemic because it spreads all over the world and kills many people, but the most important condition is to be infectious.

Starting with January 2020 the virus SARS-CoV-2 that causes COVID 19 disease, has become a new threat for human's health and for the first time the Chinese city Wuhan came into forced lockdown. Rapidly the new virus has spread all over the world and on March 11, 2020, The World Health Organization announced officially COVID 19 pandemic and in only one year at the end of January 2021 the number of confirmed infected people reached 100,200,107 cases and 2,158,761 confirmed deaths in 223 countries, areas and territories with cases (World Health Organization Report, 2021) [51].

Some factors, especially biological and epidemiological ones, seem to be similar in many countries (SARS-CoV-2 strains virulence, disease symptoms, guidelines for the diagnostic, treatment, safety and prevention protocol against COVID 19), but in fact they vary remarkably between them due to their specific economic and social characteristics (population age, demographic structure, economic performance, income level, healthcare infrastructure, access to healthcare system, societal characteristics, cultural behaviour, education level, life style, vaccination strategies, etc.) [23, 30].

The effects of COVID 19 pandemic are reflected in socio-economy with huge consequences in all economic sectors (primary sectors, secondary sectors and tertiary sectors) due to mobility restrictions, loss of productivity, remarkable costs of medical care and deaths. The restrictions imposed all over the world by governments have led to reduced workforce across all economic sectors and caused many jobs to be lost, sparkling fears of an economic crisis and recession [2, 9, 32, 49]. International Labour Organization (ILO) estimated that 81% (2.7 billion workers) global work force were affected due to totally or partial closure of the work place [28].

How much COVID 19 will cost global economy? It is difficult to estimate both direct and indirect economical costs of COVID 19 pandemic since there are still many uncertainties on the evolution and control of this multifaceted crisis. To date, there is little information in this topic and new studies are needed to offer valuable guidance for interventions, especially in vulnerable sectors.

Agriculture is a vulnerable sector and the outbreak of COVID 19 has been testing its resilience and capacity to offer food in new conditions of protective measures against virus spreading.

The aim of this paper is to present a review of the current studies on the impact of COVID 19 on the agriculture and food security on the new volatile global market and to make some forward-looking statements based on the predictions regarding pandemic evolution.

MATERIALS AND METHODS

The present paper identifies and synthetize relevant literature to provide an integrated overview of the current state-of-knowledge on the article topic, which is of great interest

nowadays. A literature review is a relevant research method when the researchers are looking to evaluate a theory or evidence in a specific area, to examine the validity of a certain theory or to investigate the effect between specific variables [46].

Depending on the goal of the review the research method may vary. To reach the purpose of this paper there were used systematic, semi-systematic and integrative research approaches using an analytic comparation of current literature, papers, studies, reports and statistics in order to offer significant insights based on the article topic and to identify knowledge gaps within literature [43, 44].

Also, it was used text mining method, which is a popular text analytical technique used to extract relationships and knowledge from a large number of textual documents [33].

The literature, papers, studies and reports used in this review are organized into the following sections.

RESULTS AND DISCUSSIONS

The COVID 19 pandemic has changed the lives of 7.8 billion people in the world and put the governments in the front of a hard decision: more investments in public safety or reviving the economy.

Many countries are now turning their attention to recover economy building resilience of business and people who need to continue their activities co-existing with COVID 19.

A report of World Bank (April 2020) stands that Sub-Saharan Africa will be the region the most affected by COVID 19 pandemic and almost 49 million people will be pushed into extreme poverty, most of the farmers from this region being small subsistence farmers

At the country-level the most affected in the number of poor people are estimated to be India (12 million), Nigeria (5 million) and The Republic Democratic of Congo (2 million), while global poverty in 2020 was closed to the level in 2017 [27, 50].

In this new reality the assessment of economic impact of COVID 19 on agriculture and food security should be viewed as a fluid process responding to international and national contexts and evolving over time.

Impact of Covid-19 on agriculture

COVID 19 disease hit agriculture all over the world but the effects are worst in areas affected by climate changes, prolonged droughts, severe flooding, pest invasion and poverty [37, 38].

The lockdown has affected worldwide, the planting of spring crops especially spring wheat, barley, canola, maize, sunflower, vegetables [42].

The new movement restrictions have caused difficulties for farmers to harvest crops or to bring their products to market, especially in areas where farmers used to sell their products directly to the consumers, but the effects are recorded in all agricultural activities. [41] [53]. Thus, the farmers had to face the difficulties to access labor, extension and consulting services and also to provide inputs (seeds, fertilizers, pesticides, fuel) for new cropping seasons due to the impact of the coronavirus on the markets ability to exchange commodities and due to the decision of many companies to reduce their global production, especially in China [45]. This markets ability depends on factors such as pandemic duration, mobility restrictions, market size and elasticity of demand and supply.

Impact of Covid-19 on food security

Previous studies emphasized that when an infectious disease outbreak occurs, hunger and malnutrition increase, putting food security under risk [10, 40].

A recently international organizations report on the State of Food Security and Nutrition in the World showed that the COVID-19 pandemic increased with 130 million the number of people worldwide suffering from chronic hunger in 2020 [21].

Fourth-five countries (thirty-four of them in Africa) continue to be under external assistance for food, accordingly with a recent report published by FAO's Markets and Trade division [18].

A Global Report on Food Crisis estimated that till the end of 2020 about 265 million people from low and middle-income countries (vulnerable groups – Fig.1) were suffering of

acute food insecurity due to COVID 19 pandemic, especially in countries affected by conflict, climate change and economic crisis [22].

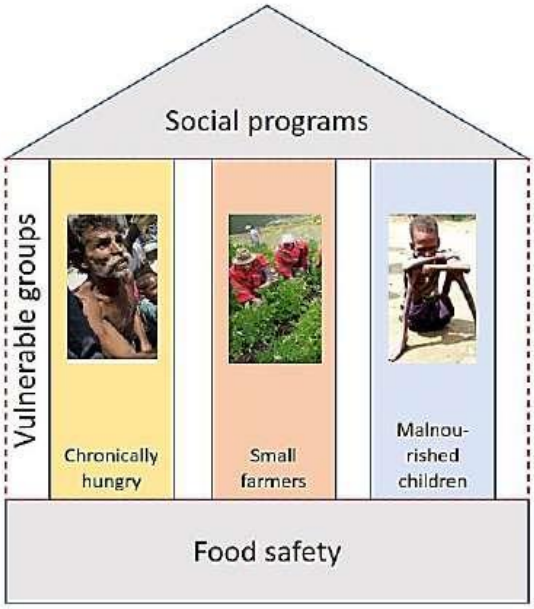

Fig. 1. Vulnerable groups to a food crisis
Source: Raúl Siche, 2020 [41].

Other report of The Food and Agriculture Organization emphasis that COVID 19 affects food security in two significant aspects: the supply and demand for food [17].

All food supply chain network, such as manufacturing, products control, packaging, distribution, storage, was affected by movement restrictions imposed by virus spreading [12].

The closure of many informal local and farmer`s markets in the urban areas has disrupted food supply systems, especially for fresh products such as meat, fruits, vegetables, eggs and milk.

Wang et al. (2020) assessed the impact of COVID 19 pandemic on diary industry in the United States and China and found that for both countries farm gate milk prices decreased, similar difficulties in moving milk along the supply chain, increased production costs, lack of operating capital and shutdown of many dairy processors due to the closing of retail, restaurants, hotels, schools, airlines [48].

At the beginning of COVID 19 pandemic the demand for food increases due to the panic induced by restrictions rules and lockdown, determining people to make shortage of some products despite the fact that governments took all measures to ensure basic food necessities [47].

Because of forced lockdown both on line demand for food and prices for basic food products have increased significantly. For example, the e-commerce in India grew up with 2 billion dollars in 2020 because of the coronavirus [8]. Also, the analytes

[16] showed that the price of the ingredients used to make a traditional chicken dish in India, grew up by 30 to 50% in June 2020 comparatively with January 2020 (Fig. 2.).

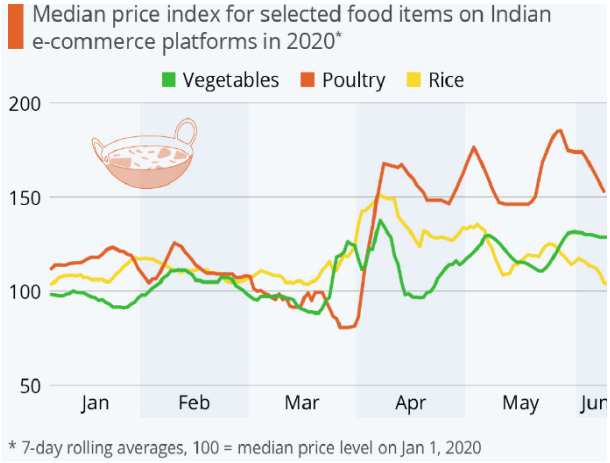

Fig. 2. Price hikes for some grocery deliveries caused by COVID 19
Source: Euromonitor International, 2020 [16].

Once the pandemic has extended the demand for food has decreased slightly due to rosed prices for a basket of food products, reduced income and job losses [19].

However, COVID 19 pandemic has the power to drive up food prices in the current market environment.

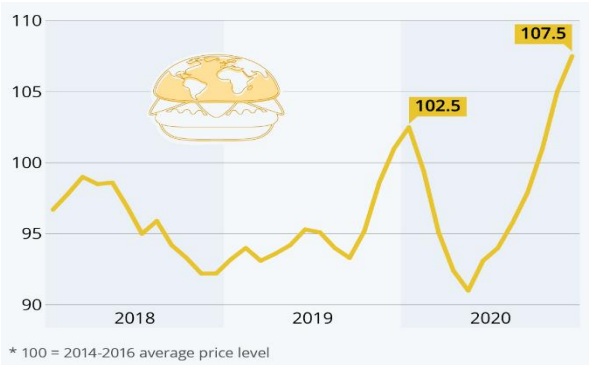

Fig. 3. FAO global food price index 2018-2020
Source: FAO, 2020d [20].

The FAO Food Price Index (FFPI), which measure the monthly variation of international prices of a basket of cereals, oilseeds, sugar, meat and dairy products, averaged 107.5 points in December 2020 versus 102.5 in January 2020 (Fig.3) [20].

Also, for the whole 2020 year the benchmark index averaged 97.9 points recording more than 25% from its highest peak registered in 2011 (131.9 points) (Fig.4).

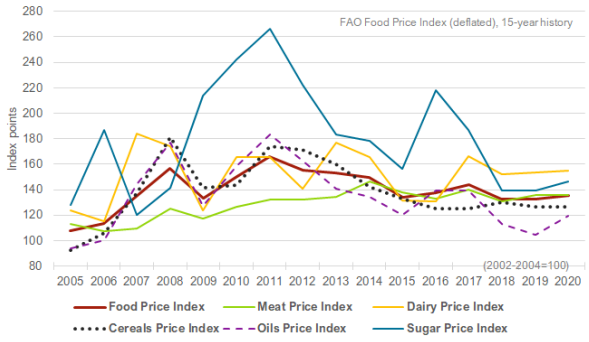

Fig. 4. Evolution of FAO Food Price Index (2005-2020)

Source: McKeany-Flavell, 2020 [29].

The evolution of the values of the FAO Food Price Index for each food products on whole 2020 and between 2002-2020, is presented in Table 1.

The FAO Meat Price Index averaged 94.3 points in December 2020, down 12.3 points (11.6%) from December 2019 and up to 1.6 points (1.7%) from November 2020. December 2020 marked the third consecutive month increase of this index. For the whole year 2020 the FAO Meat Price Index averaged 95.5 points, down 4.5 points (4.5%) from 2019 average.

The FAO Diary Price Index averaged 108.8 points in December 2020 up to 5.3 points (4,9%) from December 2019 and up to 3.4 points (3.2%) from November 2020 marked the seventh consecutive month increase in this index. For the whole 2020 year the FAO Diary Price index averaged 101.8 points, down 1.0 points (1%) from 2019 year.

The FAO Cereal Price Index averaged 115.7 points in December 2020 up to 18.5 points (19%) from December 2019 and up 1.3 points (1.1%) from November 2020, marking the seventh month of consecutive increase. For the whole year 2020 the FAO Cereal Price Index averaged 102.7 points, up 6.4 points (6.6%) from 2019 average and reaching its highest annual average since 2014.

The FAO Vegetable Oil Price Index averaged 127.6 points in December 2020, up 26.1 points (20,5%) from December 2019 and up 5.7 points (4.7%) from November 2020. For the whole 2020 year the FAO Vegetable Oil Price Index averaged 99.1 points, up 15.8 points (18.9%) from 2019.

The FAO Sugar Price Index averaged 87.0 points in December 2020, up 4 points (4.8%) from December 2019 and got down slowly 0.5 points from November 2020. For the whole 2020 year the FAO Sugar Price Index averaged 79.5 points, reaching its lowest annual average since 2008.

Table 1. FAO global food price index for each food category 2002-2020

FAO food price index							
		Food Price Index	**Meat**	**Dairy**	**Cereals**	**Vegetable Oils**	**Sugar**
2002		**53.1**	**55.2**	**46.1**	**55.6**	**55.1**	42.6
2003		**57.8**	**58.3**	**54.5**	**59.4**	**62.6**	43.9
2004		**65.5**	**67.6**	**69.8**	**64.0**	**69.6**	44.3
2005		**67.4**	**71.8**	**77.2**	**60.8**	**64.4**	61.2
2006		**72.6**	**70.5**	**73.1**	**71.2**	**70.5**	91.4
2007		**94.2**	**76.9**	**122.4**	**100.9**	**107.3**	62.4
2008		**117.5**	**90.2**	**132.3**	**137.6**	**141.0**	79.2
2009		**91.7**	**81.2**	**91.4**	**97.2**	**94.4**	112.2
2010		**106.7**	**91.0**	**111.9**	**107.5**	**121.9**	131.7
2011		**131.9**	**105.3**	**129.9**	**142.2**	**156.4**	160.9
2012		**122.8**	**105.0**	**111.7**	**137.4**	**138.3**	133.3
2013		**120.1**	**106.2**	**140.9**	**129.1**	**119.5**	109.5
2014		**115.0**	**112.2**	**130.2**	**115.8**	**110.6**	105.2
2015		**93.1**	**96.7**	**87.1**	**95.9**	**90.0**	83.2
2016		**91.9**	**91.0**	**82.6**	**88.3**	**99.4**	111.6
2017		**98.0**	**97.7**	**108.0**	**91.0**	**101.9**	99.1
2018		**95.9**	**94.9**	**107.3**	**100.6**	**87.8**	77.4
2019		**95.0**	**100.0**	**102.8**	**96.4**	**83.3**	78.6
2020		**97.9**	**95.5**	**101.8**	**102.7**	**99.1**	79.5
2019	December	**101.0**	106.6	103.5	97.2	101.5	83.0
2020	January	**102.5**	103.8	103.8	100.5	108.7	87.5
	February	**99.4**	100.6	102.9	99.4	97.6	91.4
	March	**95.1**	99.5	101.5	97.7	85.5	73.9
	April	**92.4**	96.9	95.8	99.3	81.2	63.2
	May	**91.0**	95.4	94.4	97.5	77.8	67.8
	June	**93.1**	94.8	98.3	96.7	86.6	74.9
	July	**94.0**	92.2	102.0	96.9	93.2	76.0
	August	**95.8**	92.2	102.1	99.0	98.7	81.1
	September	**97.9**	91.5	102.2	104.0	104.6	79.0
	October	**101.2**	91.8	104.3	111.6	106.4	84.7
	November	**105.2**	92.7	105.4	114.4	121.9	87.5
	December	**107.5**	94.3	108.8	115.7	127.6	87.0

Source: FAO, 2020d [20].

Summarizing previous statistics, excepting sugar, the values of the FAO Food Price Index for meat, dairy, cereals, vegetable oils increased in December 2020 comparatively with November 2020. For the whole 2020 year only the FAO Food Price Index for meat and diary decreased slightly comparatively with 2019 year.

Forward looking-statements

The forward-looking statements of COVID 19 impact on agriculture and food security

involve all factors, measures, decisions, risks, policies that may cause future results, performance and achievements in order to mitigate known and unknown effects of this unprecedent pandemic.

These statements are settled to reflect future events that are based on uncertainties, assumption and resilience.

The government from each country must continue monitoring the consequences of the pandemic on agriculture and food security, directing its actions to support especially small and medium-size farms, farmers organizations and cooperatives offering dedicated financial facilities and strengthening social protection measures to enable poor, vulnerable rural households to meet their basic needs.

The key elements to re-enforce agricultural system include keeping global food supply chain active and mitigate the effects of the pandemic across the whole food system by implementing anti-crisis measures [52].

Thus, an important measure is to keep the borders open for the trade of goods and agricultural inputs especially for critical steps in crop management, like providing seeds, fertilizers and crop protection products. Also, a great attention should be paid to phytosanitary measures to avoid the risk of new pathogen and pest outbreaks that may add a supplementary negative impact on agriculture beside the one provided by COVID 19 pandemic. For this it should be taken all measures to assure essential phytosanitary and animal health inspections.

Other measure for the immediate farms re-opening at their full production capacity and to strengthen food supply chain network, such as manufacturing, products control, packaging, distribution, storage, is to guarantee the safe movement of agricultural workers within countries and across borders according with international and national public health guidelines. Any policy which targets reducing virus transmission should ensure the access to goods and agricultural services. Additionally, new policies focused on intensive promoting of agricultural products sale, providing assistance for small poor farmers to cope with rural poverty, providing subsides, guidance in applying new agricultural technologies and field management should be very useful for mitigating pandemic effects.

A great attention should be paid to young agri-entrepreneurs who risk to be more affected by losses and financial burdens than experienced farmers, despite the fact that they are more open to introduce innovations in their business models (for example, on line marketing for agricultural products, especially organic ones).

However, governments and organizations should offer a permanent support for continuous function of local food markets and for mechanization and introduction of new technologies for post-harvest storage and processing, in order to avoid disruption in food supply chain and mitigate food losses.

CONCLUSIONS

The present review emphasizes that the COVID-19 pandemic has the potential to impact almost every facet of the agricultural industry, being an important driver to global food insecurity.

This pandemic has exacerbated and intensified already the pressure on farmers who live in areas affected by climate change, extreme weather events (severe drought, flooding, wind storms), biotic constrainers (pests, pathogens and invasive alien plants) and conflicts, increasing global poverty.

In 2020 global poverty was closed to the level in 2017, setting back by three years the world`s progress to eliminate this human's life threat.

The COVID 19 outbreak affected all crops production, all food supply chain and lead to more expensive food commodities, raising uncertainty on international markets. Higher Food Price Index for basic food basket is due to more difficult access to food products because of lower crop production, lower transactions volume, mobility restrictions, job losses and decreased population income. Also, collateral sectors like tourism, hotels, restaurants, schools, that usually supply agricultural products have been forced to face the reduction of consumers' number.

Various anti-crisis measures taken by governments and international organizations to limit the virus spreading and to mitigate the effects of the pandemic on agriculture and food security will shown up their results in the next future.

Small and medium-size farmers represent one of the most affected categories by the pandemic outbreak and beside credits and government financial support they need stronger agricultural extension and advisory services for rethinking their business models in the new social and economic context.

However, beside its negative effects the COVID 19 crisis open the door to new opportunities and it has accelerated the digital technologies application in the agricultural and food system.

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