

Article

# Analysis of Croatian public procurement notes: Green public procurement as a strategic tool to encourage sustainable food production

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## CITATION

Perica M. (2024). Analysis of Croatian public procurement notes: Green public procurement as a strategic tool to encourage sustainable food production. *Journal of Infrastructure, Policy and Development*. 8(16): 10881. <https://doi.org/10.24294/jipd10881>

## ARTICLE INFO

Received: 13 December 2024  
Accepted: 19 December 2024  
Available online: 23 December 2024

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**Abstract:** It is possible to provide green, ecological, and innovative products and services through green and sustainable public procurement. This study analyzes the opportunity offered to public contracting authorities in the Republic of Croatia (RH) in transformation from existing economy to a sustainable one through the inclusion of small and medium sized (SME) companies and inclusion of selection criteria that promote all three sustainable goals. The study employed a qualitative method and empirical analysis of public procurement procedures for eggs in the period from 2013 to 2021 in RH. The product was procured in many social institutions, hospitals, schools, student canteens and by procuring a sustainable product, added value could be created for the entire community. Data from the Electronic Public Procurement Classifieds of the Republic of Croatia (EOJN RH) and Data from the State and European Union (EU) Statistical Office were used. The research showed that sustainable procurement criteria were used for the first time in 2021, and that public contracting authorities put a stronger focus on the environmental pillar of sustainability and less or almost none on the economic and social pillar. The volume of demand and production was also calculated. The study found that the first contractor for sustainable product was SME company, producer of food, who adapted to the green conditions of public procurement in a short period of time. The paper empirically demonstrated that public procurement can be a powerful tool, but it was not used enough in the observed period for the observed products in RH.

**Keywords:** public administration; green public procurement; sustainable goals; green criteria; SME

## 1. Introduction

Public procurement accounts for 14% of the European Union's (EU) gross domestic product (GDP), which is a significant part of public investment in the EU's economy. Public entities can strategically use this lever to increase the value of each euro spent by the government and help build a competitive, inclusive, sustainable, and innovative economy (European Commission, 2017).

According to Martin and Danielsson (2016), there will be a greater emphasis on sustainable food production since it lessens negative effects on the environment and resource usage. Although it is widely acknowledged that immediate action is required to create sustainable food, there is disagreement over how to carry out the change. Several studies have highlighted public procurement as a lever to promote sustainable production UNEP (2014) and Testa et al. (2016a). Different approaches that incorporate sustainability have been developed in public procurement, for example Green Public Procurement (GPP) and Sustainable Public Procurement (SPP). GPP influences environmental sustainability goals, while SPP influences environmental, social and economic sustainability goals in public procurement processes (Smith et al.,

2016). GPP of food has been recognized as an important policy tool to promote sustainable and healthy food systems Swensson et al. (2021) and Stein et al. (2022).

Small and medium-sized businesses (SMEs) make up to 99 percent of all businesses in the EU (Eurostat, 2023a). According to the OECD (2018), start-ups and SMEs are far more adaptable than large corporations and adjust to market changes faster and can offer goods and services of the same, if not higher, quality but they are less represented in public procurement processes. The inclusion of SMEs in public procurement processes would yield substantial advantages, and efforts should be undertaken to enhance their representation.

Public food procurement, including in schools, hospitals and other public institutions, represents a significant portion of public sector budgets Krivašonoka (2019) and Swensson et al. (2021). Leveraging this purchasing power can drive positive changes in local and regional food markets towards more sustainable and equitable practices (Stein et al., 2022; Swensson et al., 2021; Xie et al., 2022). According to Boyano et al. (2019) the most popular organic food products that are bought in EU by consumers are: eggs, dairy, fruit, vegetables, hot beverages, meat (mainly in Northern Europe) and bread and bakery and there is a rising demand for healthy food and drink products both from private consumers and governments, especially in the education and health sectors. Researching the purchase of eggs in Croatia, this study will empirically ascertain whether public procurement is a lever that could aid in transforming the economy into a sustainable one. Annually public contracting authorities in Croatia procure eggs for daily use in diets and eggs can be produced in the Republic of Croatia (RH) in both traditional and sustainable ways. EU GPP criteria Boyano et al. (2019) emphasize that eggs can be procured with core or comprehensive sustainable criteria in technical specification in tenders. In this study the results of procurement procedures and the presentation of the criteria for selecting the most economically advantageous offer are analyzed to identify the sustainability goals and whether the selection criteria are more aligned with economic, social, or environmental objectives. In addition, the volume of production and demand for eggs is calculated over a period of 9 years to analyze whether this potential has been used by public authorities to purchase green and sustainable products. The study examines which public procurement procedures were used to determine the degree of transparency and whether equal opportunities are given to companies in the procurement process. The final part analyzes the results of the public procurement process and presents the size of the contractor's company and the industry to which it belongs in order to determine the successful implementation of the National Action Plan for Green Public Procurement for the period from 2015 to 2017 with a view to 2020 (NAP ZejN) part of the "Farm to Fork" strategy (Ministry of Environment and Nature Protection, 2015).

When reviewing the available literature for Croatia, legal framework of SPP, advantages and disadvantages of application of the circular economy concept and an analysis of GPP with recommendations to raise the public contracting authority's awareness of the application of environmental criteria in public procurement procedures no such empirical study was conducted (Andabaka, 2018; Klepić, 2020; Šikić and Turudić, 2020). The paper could be the basis for further research for other agricultural products and food.

## **2. Literature review**

GPP is defined as “a process in which public bodies seek to procure goods, services and works with a reduced environmental impact during their life cycle compared to goods, services and works with the same primary function that would otherwise be procured” (European Commission, 2008a). According to Czarnecki (2019) Green Public Procurement (GPP) is a regulatory tool that does not prescribe, but recommends or encourages the application of environmental standards in public procurement procedures in different stages of the product life cycle.

However, public authorities must comply with legally prescribed procedures when awarding public contracts (they have to carry out a tender according to prescribed procurement procedures, examine offers and award the contract in compliance with the award criteria). Therefore, public procurement usually favors the most economically advantageous tender (MEAT) without environmental concerns over tender with environmental concerns (Schebesta, 2018).

The European Commission adopted a public procurement strategy focusing on six strategic priorities identified in the 2017 announcement to improve public procurement practices in the EU through collaboration between public authorities and other stakeholders (European Commission, 2017). In March 2020 the EU published A new Circular Economy Action Plan (CEAP), announcing initiatives related to the concept of Life Cycle Costing (LCC), such as striving to ensure that the resources used remain in the EU economy for as long as possible (European Commission, 2020). Plan proposes sets of GPP criteria for public authorities, aims to guide them, and share good practice examples widely. Despite the efforts of the EU authorities, certain challenges remain. Research made by Oakdene (2011) highlighted that there are not enough unique elements to form criteria for a unique EU-Ecolabel for food. This complex question allows public authorities to request voluntary food certificates and potentially can lead to unequal treatment in procurement (Schebesta, 2018).

The literature highlights several key benefits of green public procurement of food. It can help reduce environmental impacts such as greenhouse gas emissions, resource use, and pollution (Hill and Collins, 2022; Kinnunen et al., 2020). It can also support local food systems, food security, and healthier diets (Gómez, 2023; Simón-Rojo et al., 2020). Furthermore, GPP can serve as a catalyst for innovation and the development of more sustainable food products and services (Krieger and Zipperer, 2021). However, the literature also identifies several challenges and barriers to the implementation of green public procurement of food. These include the higher costs of sustainable and local food products, the complexity of procurement processes and tender requirements and the limited availability of local food production to meet large-scale public demand (Aleksejeva, 2022; Kinnunen et al., 2020; Schebesta, 2018; Zielińska-Chmielewska et al., 2023). Evaluations of the actual sustainability impacts of public food procurement are also lacking, highlighting the need for more empirical research in this area (Molin et al., 2021; Xie et al., 2022). To address these challenges, the literature suggests several strategies. These include the use of life-cycle costing approaches to account for the broader environmental and social benefits of sustainable food, as well as the development of clear policy frameworks and guidelines to support the implementation of green public procurement (Bargues et al., 2019; Giacomo et al.,

2019; Orfanidou et al., 2023; Puspitasari et al., 2022). Stakeholder engagement, particularly with local producers and suppliers, is also emphasized as crucial for the success of green public procurement initiatives (Simón-Rojo et al., 2020).

Other papers focused on outcome and analyzed and estimated how many green tenders were published (Adham et al., 2012; Faith-Ell et al., 2006; Kippo-Edlund et al., 2005; Nissinen et al., 2009). Faith-Ell (2006) analyzed the application of environmental requirements in the procurement process of Swedish road maintenance. Kippo-Edlund et al. (2005) analyzed the uptake of green criteria by the content analyses of tenders in Sweden, Norway, Denmark and Finland in order to verify whether the award decisions were influenced by environmental reasons. Bouwer et al. (2006) studied the uptake of GPP practices in the EU 25 with a content analysis, based on a very large sample, but without focusing on a specific sector. Nissinen et al. (2009) investigated the existence of real differences within the uptake of green public purchasing in the three Nordic countries focusing on all sectors and considering only the above threshold tenders. Adham et al. (2012) studied the understanding of GPP in Malaysia and identified opportunities and barriers in implementing it using different methodologies, such as the content analysis of green public purchasing policies and tenders, especially related to the ICT sector.

There is also a need for evaluations of how public food procurement shapes local and regional food markets. The recent systematic literature review by Molin et al. (2021) found the positive impact of local and organic food procurement on all 3 sustainability goals. The environmental goals of sustainability are recognized as procurement of food less loaded with packaging materials and/or food with a lower environmental burden (shorter transportation) and food produced locally, seasonally, ecologically. The social goal is recognized as the procurement of healthy food, associated with loyal competition, educational approach to healthy food and safe working conditions. The economic goal is recognized as to promoting economic sustainability and creating livelihoods at local and national levels. Author highlights that despite growing literature on the opportunities and potential relating to sustainable food procurement, a minority of articles in scientific literature include the quantitative or qualitative evaluation of sustainability impacts and highlights the need for additional studies to determine how procurement decisions affect the outcome of food procurement. This paper represents such study because one of the analyzes in this paper is to determine sustainability goals and outcomes of Croatian public procurement of eggs.

### **3. Materials and methods**

#### **3.1. Hypotheses**

Four hypotheses (H1–H4) were empirically researched to investigate the role of Croatian public procurement in converting the nation's economy into a sustainable one. The idea that public procurement can be used as effective tool for sustainable production has been also supported by studies Testa et al. (2016a) and Lassen et al. (2023).

H1. The potential of public contracting authorities for the procurement of green or sustainable products is significant, but it has not been sufficiently used for the

transformation to a sustainable economy in a period of 9 years based on example of egg procurement

H2. When green criteria are used in public procurement processes, the environmental goal is more represented in relation to the social or economic goal of sustainability.

H3. Small and medium-sized businesses can respond to the green conditions of public procurement and take part in the processes.

H4. Compared to a product without green procurement criteria, the price of a product that was purchased using green criteria is higher.

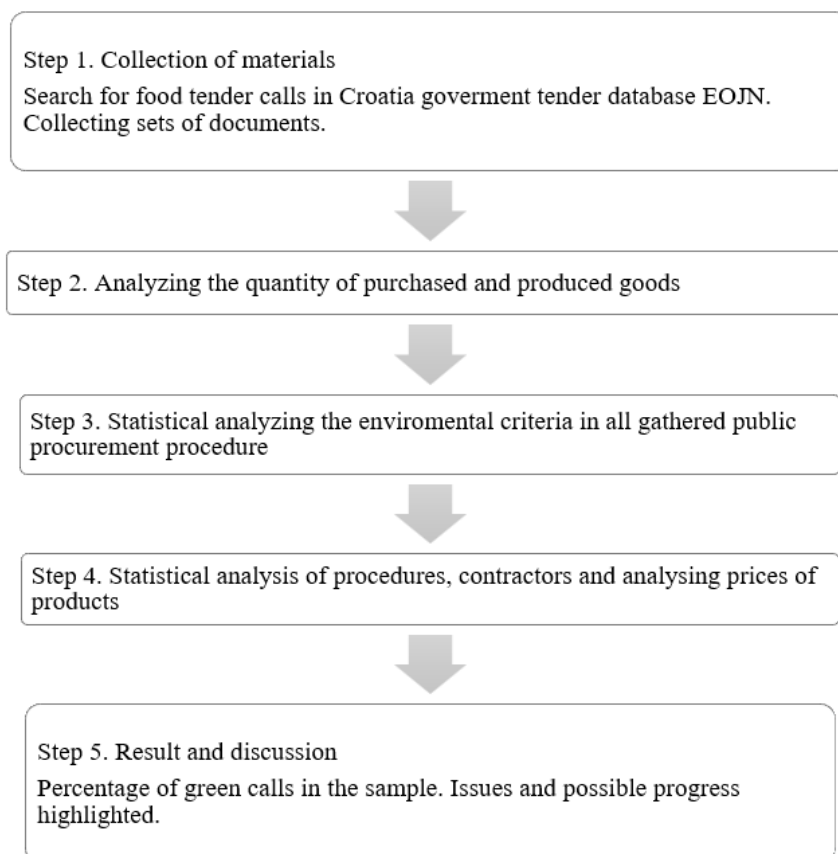
### **3.2. Data collection and processing**

The data were collected from public procurement procedures published in the Electronic Notice of Public Procurement in the Republic of Croatia (EOJN) in the period from 2013 to 2021 with Common Procurement Vocabulary (CPV) code CPV-03142500-3 eggs as the subject of procurement (European Commission, 2008b). The data were collected from EOJN platform for all public procurements above and under EU threshold. According to EU directives 2014/24/EU, 2014/25/EU, 2014/23/EU (and previous directives Directive 2004/18/EC and Directive 2004/17/EC), all public contracting authorities in the EU are obliged to publish procurement procedures depending on value thresholds in national databases or/and in EU databases. Additionally, the national database of the State Statistical Office of the Republic of Croatia was also used (DZS, 2022). This chapter provides a descriptive presentation of the database acquisition process and highlights potential issues in the gathered data.

The study's methodology involves content analysis on tender documents, specifically procurement documents and related documents. Other researchers can replicate, examine, and validate the collected data because it is publicly accessible. Prior studies on sustainable procurement research have also included content analysis, either alone or in conjunction with other techniques. In order to determine the award of contracts based on GPP characteristics, authors Kippo-Edlund et al. (2005) employed a content analysis of tenders in Sweden, Norway, Denmark, and Finland. In order to describe all the components and criteria of MEAT, authors Parikka-Alhola et al. (2006) examined the calls for tenders and other tender documentation in 180 procedures procured in 2005 in Denmark, Finland, and Sweden. Authors Faith-Ell et al. (2006) employed content analysis in conjunction with other techniques to investigate the degree to which environmental considerations are included into public procurement processes for road maintenance in Sweden. Authors Palmujoki et al. (2010) used content analysis for examining and analyzing environmental criteria in 78 public contracts in Finnish and Swedish above EU threshold. Testa et al. (2016) investigated, using content analysis, how GPP criteria were represented in public procurement processes for the Italian construction industry based on 164 bid samples.

The method is divided into five steps (**Figure 1**). In the search 41 different announcements were listed. Announcements related to the procurement of liquid pasteurized eggs were excluded from the announcements. The sample ultimately consisted of 21 procedures published in the EOJN in the period from 2013 to 2021. The information from contract award notices about selected supplier were collected

(SME company or not, the value of the contract, the type of procedure and other data). If the procurement item is divided into groups, then each group was observed separately. If the subject of procurement required the conclusion of a framework agreement for several years, each individual contract was attributed to the year in which it was signed and the quantity was proportionally divided for each future year. Collected data from contract award notices are presented in the tables below. In addition, all other documentation available in the national database EOJN were collected like bidding documentation, cost sheet, minutes on review and assessment of bids, selection decisions and other accompanying documentation.



**Figure 1.** Study method steps flowchart used for analyzing Croatian green public procurement of eggs (Source: author).

In the second step, the requested consumption egg quantities were retrieved from cost list and distributed by year, based on whether the procurement was one-year or multi-year. Author used the Republic of Croatia's national statistical database to calculate the country's organic egg production.

Third step involved analyzing the tender documents and determining whether they contained either sustainable or green procurement criteria in five phases of tendering procedure (subject matter, selection criteria, technical specification, award criteria and other contract clauses). Same approach used Testa et al. (2016). If a green or sustainable criterion was found, it was also examined which sustainability goal encompasses (economic, social, or environmental), as well as any combination of these goals. Through fourth step information about the procedures, contractors and prices were gathered from the contract award notices/tender documents and statistical

analysis was made to determine whether they contractors were part of a SME or not, with a further division into micro, small, and medium-sized businesses by accessing publicly available Fininfo portal<sup>1</sup>. This study used the division in accordance with the EU recommendation (European Commission, 2003). An SME is a company that employs up to 250 employees and whose annual turnover does not exceed eur 50 million or whose balance sheet does not exceed eur 43 million. According to the recommendation, SMEs are further divided into micro (fewer than 10 employees and annual turnover or total annual balance does not exceed 2 mil eur), small (less than 50 employees and annual turnover or total annual balance does not exceed 10 mil eur) and medium (less than 250 employees and the annual turnover does not exceed 50 mil eur or the total annual balance does not exceed 43 mil eur). The following steps involved determining the results and discussing and comparing them with those of other studies. Lastly, the research's conclusion was presented.

In order to have an overview of purchasing practices author collected tenders during period of nine years above and under EU threshold. Author did not use data for purchasing eggs that were procured through simple procurement processes because the 2014/24/EU, 2014/25/EU, and 2014/23/EU EU directives, and Croatian Law on Public Procurement and the Amendments to the Law on Public Procurement (further in text: ZJN2016) do not apply to them (ZJN, 2016, 2022). Simple procurement processes are conducted according to the regulations of public contracting authorities, which are not unique and therefore not comparable. Other mentioned studies also excluded data from simple procurement processes.

## **4. Results and discussion**

### **4.1. H1: The potential of public contracting authorities for the procurement of green or sustainable products**

This section of the paper examined whether and to what degree Croatian public authorities used green public procurement as a tool to shift the country's economy toward sustainability, using the purchase of eggs as an example. The first step involved calculating volume (in pieces and value) of Croatian organic egg production from 2013 to 2021 and created demand by public authorities for eggs with or without green standards. Based on data from State Bureau of Statistics (DZS, 2022) **Table 1** shows Croatia's total production of organic eggs from 2013 to 2021.

As indicated in **Tables 2** and **3**, the study found that during the same period, the public contracting authorities who announced the procurement in the EOJN created a demand for eggs totaling 13,871,380 pieces or in value EUR 2,147,000.

Based on the data presented, it can be concluded that the total demand from public contracting authorities for eggs in EOJN in the observed period was four times higher than the production of organic eggs in the Republic of Croatia. Of the total quantities requested, green criteria were applied in the procurement of 6% of products with an estimated value of EUR 172,539, or 8% of the value and in the last observed year.

The Ministry of Environmental Protection and Nature of the Republic of Croatia (2015) states in the NAP ZejN that public authorities should incorporate basic and comprehensive green procurement criteria for construction, food products, and office

furniture. From the data obtained above, it can be concluded that the recommendation to use green criteria in public procurement procedures for eggs only came into force in 2020 after the adoption of legal act Decision to determine the criteria and relative weights for the selection of MEAT offer, which involves the procurement of agricultural and food products as well as foodstuffs of Ministry of agriculture in 2019 (further in text: Decision), that the first tenders were launched in the area of egg procurement with green selection criteria (Ministry of agriculture, 2019).

**Table 1.** Number of produced organic eggs in Republic of Croatia (Source: State Bureau of Statistics).

Year	Consumable organic eggs (pcs)
2013.	12,000
2014.	65,000
2015.	117,775
2016.	246,890
2017.	206,000
2018.	183,000
2019.	334,210
2020.	615,340
2021.	1,501,800
Total	3,282,015

**Table 2.** Quantity overview of the demand for eggs published in the EOJN in the Republic of Croatia in pieces (Source: author).

Year	Total pieces	Green criteria	Other criteria
2013.	1,427,970		1,427,970
2014.	1,878,970		1,878,970
2015.	1,690,970		1,690,970
2016.	1,130,470		1,130,470
2017.	481,500		481,500
2018.	1,381,500		1,381,500
2019.	1,660,000		1,660,000
2020.	1,660,000		1,660,000
2021.	2,560,000	900,000	1,660,000
Total	13,871,380	900,000	12,971,380

Initiatives like European Public Health Alliance proposes and gives a possible approach for the legislative framework and propose procurement strategies like minimum organic products in procurement (e.g., 20%–50%) and other strategies which could lead to increase in demand and consequently in increase of the production of such products (European Public Health Alliance, 2021). The data in **Tables 1** and **2** suggests if Croatian public contracting authorities used core green criterion of a minimum share of 20% of sustainable products listed in the GPP toolkit made by Boyano et al. (2019) that would generate an additional requirement of 2.76 ml or 86%



of the total production of organic eggs. The data suggests that not using this approach (e.g., requiring a minimum share of 20% of sustainable products) missed out on public resources that could be invested in a sustainable economy. In addition, the obtained data suggested that it would be advisable to require similar procurement for other food and agricultural products, which would further increase the potential of public buyers.

**Table 3.** Value overview of the demand for eggs published in the EOJN in the Republic of Croatia in euros (Source: author).

Year	Total value in eur	Green criteria	Other criteria
2013.	242,428		242,428
2014.	282,036		282,036
2015.	255,491		255,491
2016.	185,812		185,812
2017.	53,089		53,089
2018.	225,629		225,629
2019.	243,325		243,325
2020.	243,325		243,325
2021.	415,865	172,539	243,326
Total	2,147,000	172,539	1,974,461

#### **4.2. H2: Representation of the sustainability goals in the criteria for selecting the most economically advantageous offer**

This part of the work answers the question of how many sustainability goals were covered by contracting bodies by applying green criteria when selecting the MEAT offer. **Table 4** shows available green criteria from Decision and all other used criteria in procurement procedures:

K1 the criterion evaluates products produced in quality systems for agricultural and food products, with additional evaluation of organic products.

K2 the criterion evaluates products that are produced in accordance with food quality standards set by European and national agricultural and food regulations.

K3 the criterion evaluates products based on transport distance and at the same time indicates sustainably produced and processed food, resulting in food with a higher value in terms of greater freshness or lower environmental impact.

K4 the criterion evaluates products based on the type and amount of packaging, distinguishing foods that are less contaminated with packaging materials and those in packaging made from environmentally friendly and/or recycled materials.

DOD: Additional assessment of compliance with environmental standards for vehicles used to provide transport services, which must meet at least the requirements for the emission of exhaust gases in EURO 5 or IV.

RR: Deadline for responding to complaints (no green criteria found in tenders).

Analyzing gathered figure, it can be concluded that price was the only criterion in public procurement until 2017. Contracting bodies did not choose green criteria for selecting MEAT offer between 2018 and 2020 (although they did have them), but used criteria like quality criterion RR—deadline for responding to complaints. Only after the introduction of Decision public contracting authorities started to make more

significant use of sustainable criteria. **Table 4** shows that the criterion used was K3, which evaluates products according to the transport distance from the manufacturer to the place of delivery. This enables the supply of sustainably produced and processed eggs, as products with shorter transport routes are valued more. In addition, the DOD criterion was introduced—to comply with environmental standards for vehicles used to provide transport services and which must meet at least the exhaust emission requirements in EURO 5 or IV. With this way of announcing the criteria, products with a lower environmental impact (shorter transport, lower exhaust emissions) were delivered, but it can be concluded that no products were delivered that would meet the criteria K1 or K2 (seasonal, ecological/integrated or food produced in accordance with the quality standards of European and national agricultural and food regulations). This paper finds through empirical analysis that the first green public tenders began to appear in egg procurement after the adoption of the legal act Decision establishing possible criteria and relative weights which confirms the conclusion from Czarnezki (2019) study where is highlighted that the national/EU law in Europe and the state/federal law in the USA should consider the introduction of mandatory GPP criteria as an incentive to implement green/sustainable criteria in GPP.

**Table 4.** Overview of type of procedures; green and other criteria per year (Source: author).

Year	Number of procurement procedures	Number of points for a particular criteria					DOD*	Type of procedure
		Price	Quality					
			K1	K2	K3	K4		
2013.	10	100						open
2014.	3	100						open
2015.	1	100						open
2016.	1	100						open
2017.	1	100						open
2018.	2	90					10	open
2019.	1	85					15	open
2020.	0							
2021.	2	73			20		7	open
Total	21							0

Authors Molin et al. (2021) found that published papers in the countries of North and South America are focused on the goals of social and economic sustainability, while European published papers pronounce more the environmental goal so it is recommended to focus research on social and economic goal in food procurement in Europe. This study empirically confirms that environmental goal is more pronounced and it would be advisable to develop more guidelines, recommendations and selection criteria that include additional sustainability goals primarily social and economic in food sector.

### 4.3. H3: Participation of SME companies

#### 4.3.1. Used public procurement procedures

To determine the transparency of the procedure and the possibility of involving as many bidders as possible, especially SME companies data on the types of procurement procedures were gathered. According to figures in **Table 4** it can be concluded that in the observed period and in the sample, only the open public procurement procedure was used, which is defined by law as a procedure in which every interested company can submit a bid and is determined to be the most common procedure according to the statistical report of Ministry of Economy and Sustainable Development (2021). The benefits of purchasing products and services, particularly food, from small and medium-sized enterprises (SMEs) are highlighted in the paper Walker and Preuss (2008), which suggests that the public authorities support the growth of a local sustainable economy by doing so. The open procedure allows any business entity, including SME companies, to be included in the procurement procedure freely and without restrictions, which could help the Croatian economy to be transformed into a sustainable economy in a faster and easier way.

#### **4.3.2. Analysis of awarded contractors**

To determine whether the contractors were part of a SME or not, with a further division into micro, small, and medium-sized businesses data was gathered from results of public procurement processes (award notices). Additionally, data analysis establishes whether contractors are classified as food producers or retailers.

Figures in **Table 5** show the analysis of the awarded contractors. According to published Notification of concluded contracts all contractors from sample were SMEs. Most contracts were awarded to the category of medium-sized enterprises (52%), followed by small enterprises (33%), and the least to micro-enterprises (14%). According to the data from table, trading companies were awarded by 23% of the total contracts issued, while manufacturing companies were awarded by remaining 77%. On the example of Great Britain, the paper Walker and Preuss (2008) found that encouraging local small producers to become suppliers of public authorities can promote sustainable development especially through development of the local economy and in encouraging SMEs to produce innovative green products and services, particularly in the food sector. From this part of the analysis, it can be concluded that, through public procurement, the Republic of Croatia has the prerequisites for the transformation to a sustainable economy (openness of the procedure, representation of SME companies), but that a sustainable economy should be encouraged by announcing more green or sustainable criteria, and that public contracting authorities should not be afraid that SMEs companies will not be able to adequately respond to green procurement conditions. Figures in **Table 5** show how the SME company, the producer of egg, has adapted to green purchasing conditions. By analyzing the data, it can be concluded that in this process both the public contracting authority and the manufacturer contributed to the transition to a sustainable economy. Ten percent of the sample is carried out according to the criteria of green public procurement so this could represent a limitation in the interpretation of the results, and additional research is recommended involving the following years.

**Table 5.** Overview of contractors published in the EOJN in the Republic of Croatia (Source: author).

Year	Total awarded contracts	Data about contractors				
		Activities	SME	Micro	Small	Medium
2013.	8	production	yes	1	3	4
	2	trade	yes	1		1
2014.	1	production	yes		1	
	2	trade	yes			2
2015.	1	production	yes		1	
2016.	1	production	yes		1	
2017.	1	trade	yes	1		
2018.	2	production	yes			2
2019.	1	production	yes		1	
2020.	0					
2021.	2	production	yes			2
Total	21			3	7	11

#### 4.4. H4: Analysis of purchase prices for products with included green procurement criteria

This section of the paper will compare the cost of a product that was purchased using green public procurement criteria with the cost of a product that does not include green procurement criteria. Ten percent of the sample is carried out in compliance with green public procurement criteria. The same might indicate a constraint on how the findings should be interpreted.

The achieved average price per year for egg without value-added tax is displayed in **Table 6**. Green criteria were not used in the procurement of eggs until 2021, and the average cost was 0.12 euros, ranging from 0.09 to 0.17 euros. Green procurement criteria are introduced for the first time in 2021 for 900,000 pieces, or 35% of the total amount of eggs purchased that year. Figures in **Table 6** shows that the average price of egg purchased without green criteria stayed the same as the previous year, but the price of an egg purchased using the green public procurement criterion is lower, at 0.11 eur/pc. The result contradicts previous findings on the prices of sustainably produced food products in Republic of Croatia. The author Diaković (2020) highlights the higher price of organically produced olives compared to conventionally produced olives. Also, Boyano et al. (2019) reported cost differences between standard eggs production and free-range eggs production as follows for Belgium 30%–50%, Spain 54%, United Kingdom 35%, France 50%–100%, Norway 32%, Denmark 57%, Sweden 76%, Germany 21% and Hungary 173%. In this research a product was supplied with the environmental goal of sustainability (shorter transport distance and use of EURO 5 or IV vehicles), and was not supplied organically produced products, which could explain the discrepancy in relation to previous research on the prices of sustainable products. The recommendation would be for public authorities to focus more on all three objectives of sustainability (environmental, social and economic).

Otherwise, there would be a potential danger of supplying conventional products, but with shorter transport distances and vehicles with the EURO 5 or IV mark.

The achieved average sales prices for eggs of size (M–L) in the Republic of Croatia are displayed on the Eurostat website (Eurostat, 2023). According to an analysis of the data in **Table 7**, by 2017, the cost of eggs purchased through public procurement had gotten close to the average selling price of eggs for the Republic of Croatia. The price of eggs purchased through public procurement has increased in comparison to the average price attained within the Republic of Croatia since the introduction of new procurement law ZJN2016, which changed the criteria for choosing the best offers (the price was no longer the only criterion). Growth varies from +56% to +70% for eggs procured without green criteria or +33% for eggs procured according to green procurement criteria. The data suggest that the price of purchased egg in Croatian public procurement without green criteria was higher than the average selling price of egg in Croatia. With the introduction of the criteria of green public procurement, the price of eggs thus procured is still higher than the average selling price of eggs in Croatia, but the difference is noticeably lower.

**Table 6.** The average price of eggs in public tenders by year (Source: author).

Year	Concluded price in eur		Number of pieces		Average price eur/pc	
	regular procurement	green procurement	regular procurement	green procurement	regular procurement	green procurement
2013.	158,051		1,427,970		0.11	
2014.	182,411		1,878,970		0.10	
2015.	163,122		1,690,970		0.10	
2016.	111,149		1,130,470		0.10	
2017.	41,169		481,500		0.09	
2018.	235,981		1,381,500		0.17	
2019.	235,981		1,660,000		0.14	
2020.	235,981		1,660,000		0.14	
2021.	235,981	97,949	1,660,000	900,000	0.14	0.11
Total	1,599,826	97,949	12,971,380	900,000	0.12	0.11

**Table 7.** The average selling price of eggs in the Republic of Croatia by year. (Source: Eurostat).

Year	The average selling price of eggs in the Republic of Croatia	
	For 100 pieces	For 1 piece
2013.	10.56	0.11
2014.	9.61	0.10
2015.	9.68	0.10
2016.	9.65	0.10
2017.	10.11	0.10
2018.	9.53	0.10
2019.	8.76	0.09
2020.	8.79	0.09
2021.	8.95	0.09

As it was said at the beginning of the analysis, public contracting authorities only started to introduce green criteria in the procurement procedures of consumption eggs in 2021, so it represents 10% of the observed sample or 6% of the observed quantity. It is suggested to further investigate the procurement of eggs in the coming years and to determine the existence of green and sustainable criteria, the volume of procured products, the award of contracts and to calculate the average price for comparison with the result from this work. This paper does not investigate the reasons for the lower price of the product procured according to green criteria, and the same can be investigated in subsequent analyses.

#### **4.5. Comparison of the results with previous studies on GPP uptake with suggestions on how to integrate economic and social pillar into GPP strategy**

The findings of the content analysis were compared to the results of other studies performed in Europe with similar methodologies. In the study sample 6% of the Croatian public procedures had environmental criteria in procuring eggs. If this value is compared with study of 2009<sup>2</sup> on the status of GPP in the EU conducted between 2006 and 2007 in the so-called “Green 7” countries this present low value, especially when taking into account the difference of fifteen years (PricewaterhouseCoopers Sustainability, 2009). For example, in the study core green criteria in food procurement is used in more than 40% of procedures for “Green 7” (between 20%–30% for Austria, Denmark and Netherland, between 80%–90% for Germany, between 60%–70% for United Kingdom and between 5%–10% for Finland and Sweden). In comparison with a study conducted in Finland, Sweden and Denmark in 2009 by Nissinen et al. (2009) the results are similar. Agricultural and related products are assessed as product groups with medium apparent greenness in public purchasing and proportion of green calls for tenders in 2005 was 52% for Finland, for Sweden 86%, for Denmark 86% or in average 66%. These two examples confirm the division between the “Green 7” and the “Other 18” made by Bouwer et al. (2006) in the study on GPP in the European Union.

Croatian public authorities can take into account the recent study findings of potential, issues and strategies to integrate the economic and social pillars into GPP/SPP for food. The findings can be summarized as follows.

1) Promoting organic food procurement—public authorities can use GPP to promote the consumption of quality local food products, which can reduce the risk of obesity and chronic diseases and support local businesses and farmers (Aleksejeva, 2022; Zielińska-Chmielewska et al., 2023).

2) Addressing economic barriers—the higher cost of sustainable food products has been identified as a major barrier to implementing SPP (Ansere, 2024). Strategies to address this challenge include increased regulatory pressure and market development for green goods and services, as well as incorporating circular economy principles into public procurement to enhance sustainability in a cost-effective manner (Alhola et al., 2018; Ciumara and Lupu, 2020).

3) Incorporating social considerations: SPP policies can compel suppliers to contribute to societal goals, such as promoting local employment and supporting vulnerable groups (Grandia and Voncken, 2019). Strategies for incorporating social

considerations into public tenders include defining procedures precisely, generating monitoring tools, developing training actions, and creating transparency systems (Bernal et al., 2019).

4) Overcoming organizational barriers: Organizational culture, risk-averse behavior of public purchasers, and lack of knowledge and understanding of sustainability among procurement officers are key barriers to implementing GP/SPP food procurement (Costa and Motta, 2019; Delmonico et al., 2018). Strategies to address these barriers include competence-building, awareness-raising, and collaboration among stakeholders (Mutangili, 2023).

5) Holistic sustainability approach: Effective implementation of green/sustainable public food procurement requires a balance between the social, economic, and environmental considerations to achieve comprehensive sustainability goals (Stoffel et al., 2019; Zielińska-Chmielewska et al., 2023). Incorporating life cycle costing (LCC) and multidimensional sustainability indicators can support the integration of these pillars in public procurement decision-making (Orfanidou et al., 2023; Wurster and Ladu, 2022). In conclusion, the research indicates that green public procurement of food in Croatia holds significant potential to drive the transformation of food systems towards greater sustainability, but its implementation faces various barriers that require a multi-faceted approach (combination of policy, capacity-building, and market development measures) to address. Further research is needed to quantify the impacts and identify best practices for effective green public procurement of food.

## **5. Conclusion**

GPP and SPP within the legal framework, aim to promote the economy's transition to a sustainable economy. The paper empirically analyzes sustainable procurement of eggs in Croatia in a nine-year period as eggs are recognized as one of most popular organic food products that are bought in EU by consumers. According to the study's findings, GPP criteria are only used in a small percentage of procedures. The demand for eggs occurs on an annual basis, but it has not been adequately used for the supply and to encourage production of sustainable eggs. The demand was four times higher than the Croatian production of organic eggs and only 10% of procurement process was used as a leverage to sustainable economy.

Findings suggest that the opportunity for green public procurement to participate in the transition to a sustainable economy was thus missed. The obtained results suggest that SME companies adapt to the green conditions in a short period of time. The findings of the conducted study do not support previously published results on the price of a product procured according to the criterion of GPP because the results indicate a lower price of the product supplied according to the green criteria, so it is suggested to further investigate the reasons.

As in most research, this work has certain limitations. The research was carried out for Croatia and for procurement of one product. The sample contained procedures with framework/multi-year contracts whose estimated values, contracted values and quantities are divided on average by year. The same could point to generalization, so additional empirical analysis is recommended, e.g., according to the type or location

of the public contracting authorities. This study will enhance the knowledge and understanding of GPP in Croatia. The findings can help government to make new strategies toward not only environmental but also economic and social goal of sustainability. Further the findings can help suppliers to make adaptation toward green criteria in public procurement. Ultimately, this study can be used as a starting point for further empirical research towards broader and more specific research into the potential of green public procurement in the transformation to a sustainable economy.

**Conflict of interest:** The author declares no conflict of interest.

## Notes

<sup>1</sup> <https://www.fininfo.hr/About/Who>

<sup>2</sup> Collection of statistical information on green public procurement in the EU: report on data collection results.

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