Market performance of rice in Banten Province: A structure-conduct-performance approach

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Abstract. The presence of the modern rice milling industry affects the supply of unhusked grain and rice in Banten Province. Due to larger storage capacity, processing machinery, and efficient business processes, the industry has gained comparative and competitive advantages over other industries in the current market structure. The aim of the study is to analyse the structure, conduct, and performance of the unhusked grain and supply chain from the primary data. The findings revealed that the presence of the modern rice milling industry has short-term effects on the unhusked grain and rice supply chain and has the potential to transform the structure of the unhusked grain and rice market in the long term. This shift also impacts the roles and sustainability of the small- and medium-scale rice milling industries. In the future, market performance will be characterised by an increasing level of competition among entities to secure higher supplies of unhusked grain for processing into rice. The recommended policy changes aim to increase rice production and enhance the regional government's role through a regional state-owned food business entity in the rice market. Furthermore, the revitalisation of small- and medium-scale rice milling industries demands government support to enhance their operational efficiency.

1 Introduction

Rice plays an important role in the Indonesian economy. The rice economy includes not only production, but also distribution and marketing. The process of producing rice involves many actors, such as farmers, unhusked grain collectors, milling factories, wholesalers, retailers to final consumers, household consumers, non-household consumers (hospitals, dormitories, and jails), hotels, restaurants, and catering. Each of these rice processing and marketing actors has a profit margin that drives the economy.

Rice is the staple food of the Indonesian people, and the availability of rice reflected in stable prices is often associated with the success of the ruling government, so the government will intervene in the form of policies to anticipate the rate of inflation in addition to having a role in the process of rice production and distribution. Rice farming input subsidy programs,

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government purchasing policies on unhusked grain and rice, rice import policies, social assistance, and rice price stabilisation are some of the many roles of the government in the rice economy. An increase in the price of rice, for example, will have a significant impact on the cost of living for the middle and lower-income groups. A sustained increase in rice prices will contribute significantly to inflation.

In the context of reducing inflation, the rice supply chain still faces several challenges, including production problems, inefficient distribution, and difficulties in marketing rice to consumers. These challenges can disrupt the continuity of rice supply and price control. As observed by Oksalia et al. [1], price fluctuations, lack of market information, and low prices received by farmers are common issues in rice marketing. Banten Province is a rice production centre, but food price volatility, especially rice, is relatively high. Rice is one of the commodities that has a relatively large contribution to inflation. Banten Province, which is located not too far from the production centres and rice wholesale markets, experiences massive inter-regional trade with production centres such as other districts in West Java Province, the Cipinang wholesale market, and other rice wholesale markets in the production centres in West Java and Central Java Provinces. The supply chain characteristics of rice in cities and districts in the province also vary.

Based on the description above, this paper aims to analyse the performance of unhusked grain and rice markets using the structure, conduct, and performance approach in Banten Province. It is necessary to understand how the rice marketing system works, how to deal with its challenges and obstacles, and to develop better policy recommendations for maintaining supply and controlling inflation.

2 Methodology

This study uses a case study of three cities in Banten Province selected as the sample for the consumer price index (CPI), namely Tangerang, Cilegon, and Serang. In addition to the three Consumer Price Index (CPI) cities, the study was also conducted in the rice production centres in Pandeglang and Lebak Districts. The selection of locations was done deliberately using a snowball sampling technique. Primary data were collected through questionnaires aligned with in-depth interviews with rice marketing actors, namely farmers, intermediary traders, small, medium, and large-scale RMUs, as well as large and small traders in the markets. The number of respondents interviewed was 16 rice marketing actors consisting of farmers (1), large-scale RMUs (4), medium-scale RMU (1), small-scale RMU (1), large traders (4), and small rice traders in each of the three CPI cities and two districts in Banten Province (5). Meanwhile, secondary data were collected from various authorised and credible agencies at the provincial and district levels, such as the agricultural office, trade and cooperative office, market office, and BPS-Statistics Indonesia.

The data collected were then analysed using descriptive statistical analysis techniques and presented in the form of tables and figures. The analysis approach uses supply chain analysis and is followed by a review of the rice supply chain using structure, conduct, and performance analysis. Given the different unhusked grain and rice markets and the wide scope of the analysed markets, the analysis focuses on the actors who are the strategic nodes of unhusked grain and rice marketing.

Market structure discusses how a market is organised and determines the type of market. Determination of market type is preceded by analysing and mapping the aspects of grain and rice market share in the location of each market participant involved. Market behaviour discusses the behaviour of each actor with existing market conditions. Behavioural identification was carried out by looking at aspects of the level of competition and how each actor adapted to the changes that occurred. Market performance discusses the relationship between the existing market structure and behaviour by looking at the development of marketing margins. The development of marketing margins illustrates how efficiently a market can run and develop with the rate of profit received by each business actor. A smaller marketing margin value indicates more efficient market performance.

3 Results and discussion

3.1 Dynamics of unhusked grain and rice production capacity of Banten Province

The dynamics of GKG production in Banten Province increased in the 2021-2022 period but decreased in the January-April 2022-2023 period (Fig. 1-A). The rice production level in 2021 was 1.6 million tons and increased by 11.56% in 2022 to 1.8 million tons. Meanwhile, in the January-April 2022 period, the rice production level was 807 thousand tons, which decreased by 3.99% in 2022 to 745 thousand tons. The decline in paddy production in May-December 2023 is predicted to continue as a result of El Niño [2].

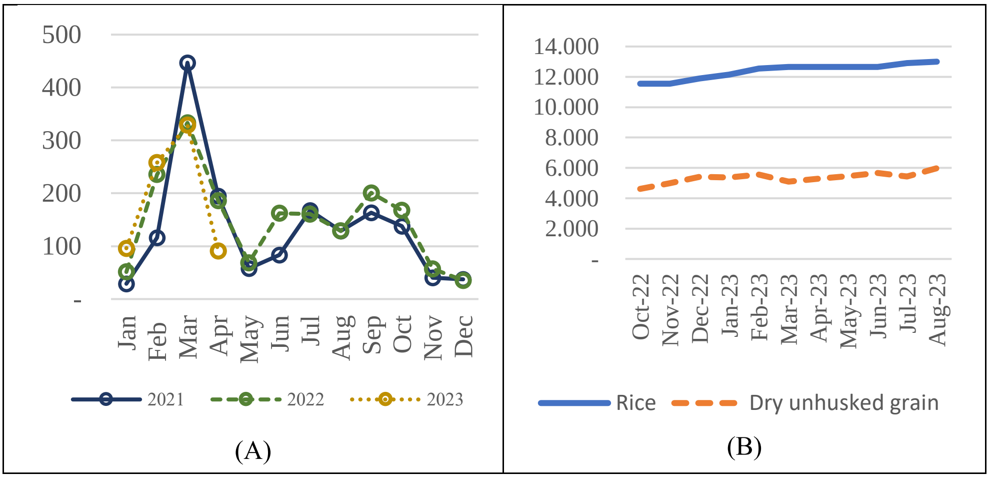

Fig. 1. Dry unhusked grain (GKG) production in thousand tons (A) and medium-rice price in IDR/kg (B), 2021-2023.
Source: [3,4]

Banten Province has three main rice production areas: Pandeglang, Serang, and Lebak Districts. The total production from these three districts is 1.4 million tons, which contributes to 79.46% of the total GKG production in Banten. Some of the unhusked grain from these three districts is processed by rice mills in Banten Province, but some is sold outside Banten Province. Some areas that buy unhusked grain from districts in Banten Province are Bogor, Karawang, and Sukabumi Districts. These areas generally border the Banten Province and are generally large traders with high purchasing power. Thus, the calculation of rice production cannot use the conversion formula where rice for food is formulated as 56.96% of GKG production.

The resultant decrease in production due to El Niño and the sale of unhusked grain from Banten Province resulted in an increase in rice prices (Fig. 1-B). The price of medium rice continued to increase throughout the period from October 2022 to August 2023. The average increase in the price of medium rice during this period was 1.2%/month. In contrast, the price of wet unhusked grain (GKP) and GKG at the farm level experienced price fluctuations based on the harvest cycle. The price of GKG decreased in March because of the rainy season harvest. The price of GKG fell again in July, when the dry season harvest began. The development of the prices of GKG and rice shows that the behaviour of the GKG and the rice market are different.

3.2 Structure, conduct, and performance of District rice commodities

The availability of rice is sourced from major rice production areas in the Banten District, as well as from other districts outside the province. The current trend is that when there is a harvest in one production area, traders within and outside the province immediately purchase GKP from the fields. Discussions and observations were conducted in Lebak and Pandeglang Districts to confirm this phenomenon.

A complete description of grain and rice marketing is shown in Figure 2. The scope of these supply chains is not limited to the administrative district, meaning that the grain market can freely enter or leave the district. The main actors in this condition are intermediary traders, both inside and outside the district, who interact with each other in the grain market. Different from the rice milling industry, the raw materials for grain and rice can come from within or outside the region. Finished rice products produced by the milling industry can also supply consumers within or outside the region.

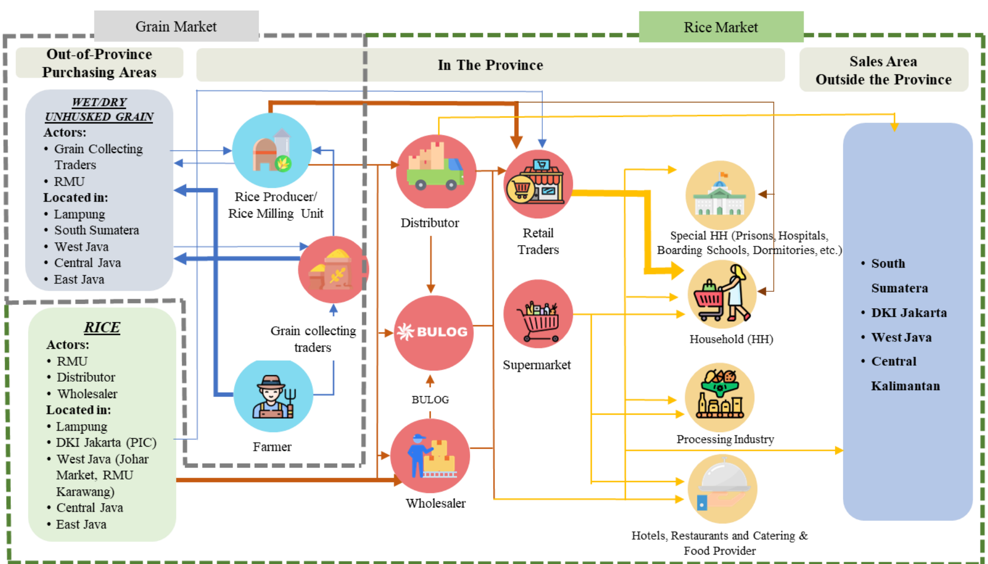

Fig. 2. Grain and rice marketing supply chain in Banten Province, 2022.

Rice produced from rice mills is marketed directly to consumers within or outside Banten Province. Information in the field obtained from rice sellers states that the rice sold does not always come from within the district, rice traders get supplies from the Cipinang wholesale market, Johar Market, Karawang, Sragen, and several production centres on the island of Java. The quality of marketed rice on average, is medium since the market for premium rice is limited.

3.2.1 Unhusked grain and rice market structure

Based on the description of the above-mentioned supply chain in Banten Province, the crucial and central point of the rice supply chain can be distinguished from the activities of purchasing GKP and GKG by rice mills and the activities of selling rice, which are also carried out by rice mills. The development of the milling industry of various scales in Banten

Province decreased from 7,489 business units in 2012 to 6,716 rice milling business units [5]. Table 1 shows the distribution of the number of rice milling businesses in Banten. Small-scale milling businesses dominated the market (96.07%), followed by medium-scale (3.69%), and large-scale (0.24%).

Table 1. Number of rice milling businesses in Banten, 2020.

No.	District/City	Number of Businesses	Milling Scale		
			Small	Medium	Large
	(1)	(2)	(3)	(4)	(5)
1	Pandeglang District	1,949	1,919	25	5
2	Lebak District	1,827	1,702	116	9
3	Tangerang District	965	942	23	-
4	Serang District	1,670	1,609	61	-
5	Tangerang City	10	10	-	-
6	Cilegon City	44	40	4	-
7	Serang City	249	228	19	2
8	South Tangerang City	2	2	-	-
	BANTEN	6,716	6,452	248	16

Source: [5]

Based on the characteristics observed in the field, almost 66.74% of small-scale rice milling businesses do not have such records. They use simple processing machines and run their businesses inefficiently. Small-scale milling businesses have a restricted market which includes three types of business activities: (1) grain milling services provided by collectors, (2) grain milling services provided by farmers for their own consumption, and (3) milling their own grain into rice for sale. These business activities are carried out in limited volumes and markets.

In its development, there is a new player in the large-scale rice milling business, namely PT Wilmar Padi Indonesia (WPI), which has been operating in the Banten area since June-October 2022 which is managed in a modern way by utilising silos to store rice, and using modern milling machines and utilising all by-products with the concept of zero waste. In addition to WPI, other large mills operating in Banten Province include Karya Muda, Ar-Rahman, and Mugi Jaya.

The efforts made by rice milling businesses of various scales to obtain unhusked grain within the region are shown in Figure 3. Over 59.75% of the total unhusked grain production in the region was marketed outside the district. Meanwhile, players in the region were only able to absorb as much as 40.25%. The market structure of milling businesses competing for unhusked grain both within and outside the district can be classified as perfectly competitive market [6]. This type of perfectly competitive market is characterised by a large number of buyers and sellers.

Further investigation into the competition between rice milling businesses within the district itself reveals an interesting phenomenon. The big players only get a total of 5.25% of the total unhusked grain traded within the district. Most of the unhusked grain goes to small- and medium-scale milling businesses. The condition of the unhusked grain market structure is different for each group of milling businesses.

Small-scale milling businesses are widespread in almost every rice production centre. Based on field information, some small-scale milling businesses obtain unhusked grain supplies from farmers around the location only and in areas that are relatively inaccessible to out-of-area rice collectors who harvest rice using combine harvesters. Information in the field states that in addition to the unhusked grain to rice process, there is also a rice-to-rice process.

Rice millers in the Lebak District even have to send rice to Cianjur for the polishing process, which is then re-marketed in the form of premium rice.

The dynamics of the unhusked grain market at the farm level where farmers can only sell unhusked grain to a few intermediary traders or directly to local milling businesses, the market structure is classified as oligopsony. The number of farmers who sell unhusked grain is greater, while there are few unhusked grain buyers. This condition is in line with the results of research on the unhusked grain market structure at the farm level [7].

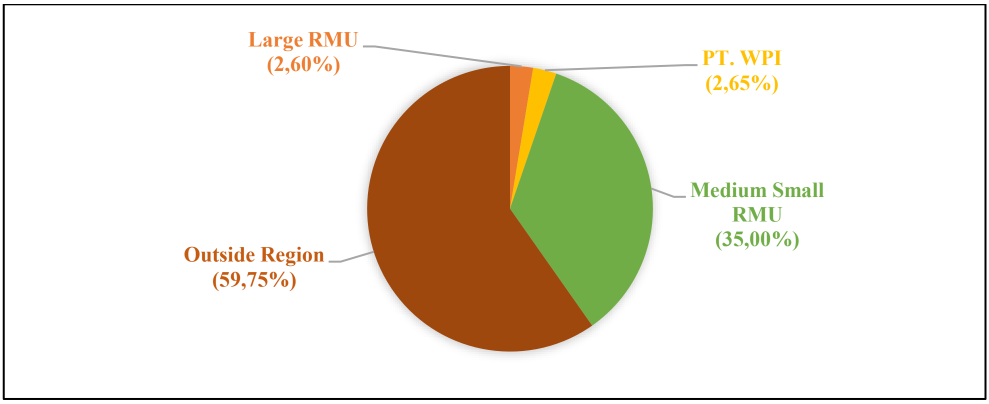

Fig. 3. Proportion of the unhusked grain market share within Banten Province, 2022.

3.2.2 Conduct of unhusked grain and rice market

Unhusked grain and rice are commodities that are the starting point for interactions that occur between actors and form market mechanisms. Market behaviour is the average behaviour of each actor that adapts to the existing market structure. Market behaviour can be explained by pricing practices, the relationship between actors, and the price transmission elasticity of the two commodities.

The battleground for unhusked grain production is getting fiercer for market players. Scattered small milling businesses survive by getting unhusked grain supplies from farmers' fields and households who want to grind GKG into rice. The competition is more stringent for medium to large-scale milling businesses.

Information in the field showed that the price of GKP rose from IDR 5,000/kg to above IDR 6,500/kg when the field survey was conducted. The increase in GKP prices during the harvest season is an anomaly and unusual phenomenon. The significant increase in the demand for unhusked grain is due to many interrelated factors, including policy changes related to the increase in government purchase prices and the increase in rice prices at retail traders. This condition is in line with a previous study [8], which states that changes in retail prices significantly cause changes in unhusked grain prices at the farm level. This sentiment triggered massive buying actions by market players to secure stocks and business continuity.

The influx of intermediary traders from outside the city is more than the previous season because Banten Province is an area that is relatively early entering the harvest season which takes place in January-March 2022. As a result, the unhusked grain market in the district became more crowded with traders from other districts. The "price war" between traders is a condition that cannot be avoided in the field due to the more crowded unhusked grain market by buyers. Usually, in "normal" conditions, farmers as producers are price takers, but in the early harvest season of 2022, they are quite favoured. The role of a price taker for farmers receives a smaller share of the value compared to unhusked grain buyers, in this case, collecting traders and local milling businesses.

PT WPI, as a new player with a storage capacity equivalent to three large mills, is only able to fill 2-5% of the unhusked grain stock and is required to look for unhusked grain and rice from outside the district. The scale of the large milling business determines more of the GKG requirements that can be accepted for milling. PT WPI receives GKP from anyone with a moisture content of 24-28% and when harvested using a combine harvester.

Not much different from the condition of the rice market within Banten, the trend indicator of rice prices increased following the trend of unhusked grain prices. Distributors and traders have difficulty obtaining rice supplies from milling businesses within the district, outside the district, and business partners outside the district. Traders within the district are supplied with rice from various regions, with a composition of around 35% from within the district and the remaining 65% coming from outside the district. The Banten rice market also reaches outside the district by distributors and wholesalers, but in small numbers, meaning that traders mostly serve the market within the district.

Although the unhusked grain and rice markets are structurally different, they are related to each other because the availability of rice in the market is determined by the production of unhusked grain previously produced by farmers. Examining price performance in the two markets and the studies conducted by Chaudari et al. [9] and Novianti et al. [10], both have integrated price conditions, and price transmission between the two markets can occur in both directions at each level of marketing actors. Other studies [11−13] have confirmed and strengthened this phenomenon.

As additional information, there is a particular rice player in Serang City, PT Agrobisnis Banten Mandiri (ABM). The ownership of PT ABM is the Banten Provincial Government, so PT ABM is a BUMD-Perseroda. PT ABM is mostly engaged in distributing rice to consumers directly through a program initiated by the Banten Provincial Government through a market network in the form of stalls in eight districts/cities. Since 2019, PT ABM has expanded its stall network to 734 stall business units. Furthermore, in running its business, PT ABM functions to participate in ensuring the availability of rice in the market for the community and strengthening the rice marketing supply chain. PT ABM does not have a milling business in its operations. Rice is procured from rice milling businesses in the district, which are then packaged and marketed.

3.2.3 Unhusked grain and rice market performance

In general, looking at the development of the MPP value in the previous year, namely 2021, the performance of rice marketing in the Banten District is relatively efficient when compared to other districts in Indonesia [14,15]. The MPP value increased in the shortest trade chain from 6.12% in 2021 to 6.99% in 2022. Meanwhile, in the longest trade chain, the MPP value of rice decreased from 36.29% in 2021 to 30.09% in 2022. The number of actors involved in the shortest chain involves one actor, namely retail traders. Meanwhile, the longest trade chain involves two actors, namely wholesalers and retailers. The complete MPP value of rice in 2022 is illustrated in Figure 4.

In the unhusked grain market, the value of the margin obtained by the milling business is eroded due to the increase in unhusked grain prices at the farm level. The price of unhusked grain is the largest component contributing to the price of rice because it is the main raw material in processing rice that is ready for consumption. Information in the field shows that some medium-scale rice milling businesses are even threatened with business continuity due to the disruption of unhusked grain supply, so they have temporarily stopped production. Marketing margins on unhusked grain in the Banten District are relatively inefficient when compared to other regions in Java Island because the average small-scale rice milling business uses simple machinery, so the costs incurred to produce rice are relatively large

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Commodity Supply Chain	Trade dan Transportation Margin Value (TTM) (%)						TTM Total (%)
	Producer	**Rice Milling Unit**	**Distributor**	**Wholesaler**	**Retail Trader**	**Consumer**	
Shortest Supply Chain	 Unhusked Grain				6.99	 Rice	6.99
Longest Supply Chain				21.93	6.69		30.09

Fig. 4. Value of trade and transportation margins in rice marketing channels in Banten District, 2022.
Source: [15], modified

The smaller the margin value, the more efficient is the rice market. The margin value is determined by the amount of costs incurred on a product produced. The phenomenon that occurs in the Banten District compared to the results of Suminartika's study [16] is the opposite. The study states that marketing rice within the production centre area is relatively more efficient and profitable for rice milling businesses than rice marketed outside the consumer centre area.

An interesting phenomenon is that some rice milling businesses in the rice production centres in Lebak District actually sell their rice outside the district, namely to the Bogor and Sukabumi Districts. Lebak, Bogor, and Sukabumi Districts are relatively close in terms of distance, and the prices offered are more competitive than rice milling businesses in Lebak District sending their rice to Banten Province markets such as Serang, Cilegon, and Tangerang Cities, which are further away.

Monitoring in the field, BULOG rice is available in the market, but BULOG limits the amount of rice supplied by wholesalers. Meanwhile, information from retail traders shows that BULOG rice is not very popular with consumers on the grounds that they do not like it and tend to choose other rice whose price is slightly above BULOG rice. This condition is complained about by wholesalers because it has the potential to conflict with law enforcement authorities, who consider it a violation of the law.

The study conducted by BPS-Statistics Indonesia in 2020 placed Banten Province as a rice production centre but experienced a rice deficit status. The study emphasised the results of the analysis in this study and the need for more efforts from the local government to be more responsive to rice price fluctuations at the consumer level. Banten is relatively close to the Cipinang Main market and Johar Market in Karawang, so additional rice supply in the market can be quickly imported from these two markets.

4 Conclusions and policy recommendations

4.1 Conclusions

The market structures of unhusked grain and rice are different, but both have a strategic node, namely in the rice milling business that processes unhulled rice into rice. The structure of the unhusked grain market within Banten is oligopsony, while the rice market tends to be perfectly competitive. The circulation of unhusked grain or rice is not limited to within the region, but also outside the region. The availability of unhusked grains and rice within the region tends to be dynamic over time. Milling business actors are the most affected by fluctuations in unhusked grain and rice prices. Milling businesses, especially small- and medium-sized ones, are unable to compete with unhusked grain collectors from outside the district. The consequences of this condition, if it continues for a long time, will threaten business continuity and supply disruptions at the consumer level. Market performance, the value of trade, and transportation margins in the rice market are relatively more efficient, but the value of margins in the unhusked grain market is the opposite. This condition is due to an increase in production costs. More rapid efforts are needed to respond to rice price fluctuations at the consumer level and protection in favour of farmers as the main producers of unhusked grain.

4.2 Policy recommendations

The alternative policy recommendations offered are as follows. (1) Local governments and the Regional Inflation Control Team (TPID), in responding to food price fluctuations, especially rice, are advised to increase the supply of rice in the market from other districts. (2) Operational inflation monitoring, in addition to the unhusked grain and rice market supply chain, requires the preparation of a food availability balance sheet that describes the amount of rice in the region by considering inter-regional trade. (3) Local governments initiate inter-regional cooperation schemes, especially rice production centres, to ensure the availability of rice in the region. (4) Local governments and the Ministry of Agriculture, through the Directorate General of Food Crops, protect local milling businesses by facilitating small- and medium-scale milling businesses with upgrading equipment and capital assistance. (5) Local governments and the Ministry of Agriculture, as well as business players in the rice industry, coordinate with each other in an effort to ensure the availability of rice in the region. (6) The Ministry of Agriculture makes efforts to increase production in Banten Province by conducting programs and activities that have an impact on rice production.

Acknowledgement. The authors would like to thank the Central Bank of Indonesia Representative Office of Banten Province for funding the activities in collecting data and information in preparing the paper so that we can present the results to the public.

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