Elevational Impact on Konjac Price Amidst Export Restrictions to China

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Abstract. Porang or konjac (Amorphophallus muelleri) farmers have complained about the drastic decline in the selling price of konjac. The export restriction of Indonesia's konjac to China had resulted the excessive supply. The lower price, the weaker of bargaining power of farmer. Thus, threatened the sustainability of exports and farmers’ prosperity. Farmers were dependent on middlemen because of the lack of transportation and harvesting facilities. The study was conducted on the differences in the elevation of locations, considered Pangandaran and Purworejo Regency in September to December 2023. The analytical method used was Ordinary Least Square (OLS). Variables that significantly influence the selling price were farmers' knowledge of konjac trade between Indonesia and China, elevation (MASL), processed konjac, duration of storage, and education level. Farmers who know that China banned export tend to sell konjac prices at very low prices because they were unable to comply with standard operating procedures for cultivation technique and post-harvest. Exports in the form of tubers have been very at risk of contamination and tuber rot. Konjac was not recommended to be stored long after harvest. Processed konjac into chips has been effective in reducing the water content so that the quality of konjac does not decrease.

Keyword: Export; Farmer; Import; Konjac; Price

1 Introduction

Plants with the Latin name Amorphophallus muelleri are commonly referred to as konjac in Indonesia and in international trade. Konjac can reach a height of 1.5 meters and thrives in tropical forests. Konjac grows in a variety of soil types at elevations ranging from 0 to 700 meters above sea level (MASL). The Ministry of Agriculture is concerned about the development of konjac cultivation and processing in Indonesia as a means of reducing reliance on rice [1], [2]. Konjac is widely used in functional foods, animal feed, and as a gelling support agent [3]. Konjac flour can be employed to make konnyaku and shirataki, which are popular in Japan, China, and Taiwan. Indonesia's konjac tuber production potential in 2020 will be 142,000 tons, with a processing capacity of 89.65% for export purposes. The resulting production will later be intended for domestic demand and if there

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is an excess it will become a production opportunity for export (Saputro et al., 2021). Indonesia's konjac tuber production is expected to reach 600,000 tons by 2024. Konjac has been used for diet food and cosmetic ingredients since the Japanese colonial period [4]. The content of glucomannan in konjac can be used for the treatment of people with diabetes mellitus [5]. Because Indonesia does not yet have a specific konjac HS code, Indonesian business actors have been exporting with a variety of HS codes, including HS 12129990 and HS 07141011. This has resulted in less accurate measurement of Indonesia's konjac export data.

Agriculture sector contributes to The Sustainable Development Goals (SDGs) that against poverty as one of indicators in SDGs. Farmers have always exposed the failure of harvesting because of climate anomaly, pest and disease, and price fluctuation. Encouraging the farm household economy should cultivate plant that has high economy value. Planting paddy and other tubers such as cassava and sweet potato might derive low income because the low selling price in the market. Farmer who plants paddy may incur loss because many cost variables [6]. Farmers chose konjac as resilience commodity having high value added. Farmers were motivated by the successful experience of exporters that inform the chance to gain the high price. Thus, farmers can upgrade their economy and prosperity toward commodity that has been needed international market and has benefits of being processed into a variety of products. Konjac can be expected to be an effort to achieve agricultural sustainability through adaptation to climate change, economic growth that benefits the poor and economic growth that benefits the poor.

China has stopped importing konjac from Indonesia in the last two years, despite China being the country with the highest demand for Indonesian konjac. On an international scale, China has the largest processing industry. China has banned Indonesian konjac exports because Indonesia failed to follow many standard operating procedures (SOPs) for konjac cultivation, processing, and shipping. Export protocols, food safety, food health standards, information on the origin of goods, and the packaging process are all factors to consider in the konjac handling process [7]. The suspension of Chinese konjac imports from June 2020 to November 2021 resulted in an oversupply of konjac tubers in Indonesia. Farmers who do not have other cultivated plants besides konjac suffer huge losses due to extremely low selling prices. China began to allow konjac imports in mid-2022, but Indonesia was required to follow the provisions of the General Administration of Customs of the People's Republic of China (GACC). GACC was designed for Indonesia to ensure the safe entry of dry konjac flakes, to prevent the introduction of plant-disturbing organisms, and to protect human and plant health. The processing method and form of konjac exported can influence the decision of the export destination country to accept or reject the product [8]. The form of konjac that is still intact, which is tubers, is very susceptible to mold and disease, resulting in a decrease in konjac quality. Fungi and plant diseases can quickly develop on konjac tubers that are not processed immediately, and this is aided by unsuitable humidity conditions for post-harvest handling of konjac [9]. Thus, exported konjac must obtain permission from the Ministry of Agriculture by conducting product inspections and quarantines and issuing official Phytosanitary Certificates for each shipment of products that meet the requirements.

The study was conducted in two locations: less than 500 meters above sea level and more than 500 meters above sea level. Purworejo Regency has geographic location about less than 500 meters above sea level, while the altitude of Pangandaran Regency was more than 500 meters above sea level. Porang farmers in the two locations complained that the price of konjac had dropped dramatically for two consecutive years, from an average of IDR 14,000 per kilogram to an average of IDR 2,000 per kilogram during the survey,
despite the fact that the two locations had become provincial konjac production centres. Because most farmers are unable to sell directly to the market or konjac processing factories, they must rely on the prices set by collectors and middlemen [10]. Competitor countries that also supply konjac to China, namely Japan, Taiwan, and Vietnam, also have an impact on China's purchase price of konjac. When a supplier is present under an agent contract, the agent frequently bills the same amount for what the agent sells, whereas the distributor is free to add any purchase price, determining the mark-up, in determining the selling price to the customer [11]. The objective of the research on determining the selling price of konjac is to examine the impact of Chinese import regulations, cultivation, social, and economic factors on the dynamics of changes in konjac prices. Because konjac is an export commodity and a source of income for farmers, sustainable konjac marketing is critical. Farmers can reduce their exposure to market fluctuations in konjac prices. Prospects for konjac development must be considered in order to diversify alternative food sources other than rice.

2 Methods

2.1 Data collection method and location

This study used two types of data, consist of primary data and secondary data. Primary data was obtained by collecting samples or respondents that cultivated konjac through surveys, while secondary data was used as supporting data collected from relevant sources from offices of relevant agencies such as the agricultural service, Central Bureau of Statistics (BPS) and other sources needed in this study. Survey method used in research. The use of this method aims to get a picture that represents the research area correctly. Data collection was accomplished by interviews and the supporting tool was a structured questionnaire to be asked to farmers. The sample locations were purposively selected, Pangandaran and Purworejo districts were considered based on the results of discussions with the local food farmer and the suggestion from Balai Penyuluhan Pertanian (BPP), where these districts are quite large producers of porang. In addition, the choice of the two locations was also due to the characteristics of the suitable area and there were people who had a livelihood planting Porang on plantations. The research was conducted at two different locations, namely locations less than 500 meters above sea level and more than 500 meters above sea level. The research had been done at two difference altitude to analyse the cultivation to the marketing process because of difference access to the konjac processing factory. The lowland easily tends to reach the factory and information, but the upland area has long distance obstacle and limited internet signal access. Primary data collection at the farm level was carried out by simple random sampling because the respondents were relatively homogeneous, namely porang farmers [12], [13]. Each area used in the study was represented by 30 respondents in Pangandaran Regency and 30 respondents in Purworejo Regency. The larger the sample from the size of the existing population, the better, however, there is a minimum limit that must be taken by researchers, namely as many as 30 samples [14].

2.2 Analysis method

This study used quantitative data analysis. Quantitative analysis uses ordinary least squares analysis. OLS (Ordinary Least Square) is a regression method minimizing the number of
squared errors, the sum of square differences between the observed and predicted values [15]. The OLS estimated the regression coefficient (β) by minimizing error. This analysis was employed to predict the factors that affect the selling price of konjac. The OLS also depicts the relationship between the independent variables (restriction of import by China, altitude, processed konjac, land area, storage time, farming system and hours of accessing news) or explanatory variables and the dependent variable (the selling price by farmers) [16], [17]. The OLS formula of selling price estimation were
\[
Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + \mu_i \quad (1)
\]
Information:
Y = Selling Price
\(\alpha_0\) = Intercepts
β1-β8 = regression coefficient (estimated parameter)
\(\mu_i\) = error term (residual)
X1 = China Imports
X2 = Altitude (MASL)
X3 = Processed Konjac
X4 = Land Area
X5 = Storage Time
X6 = Farm System
X7 = Education
X8 = Access News

### 2.3 Classical regression assumption test

In this analysis the Ordinary Least Square (OLS) method is used to obtain BLUE (Best Linear Unbiased Estimator) results. Before determined the regression, it is necessary to test the classical assumptions required for the model to be accepted. The normality test is a test used to determine whether the residuals of the regression results are normally distributed or not. One of the normality tests that is often used is through the Jarque – Bera (JB) Test. Multicollinearity stated a condition where one or more independent variables are correlated with other independent variables, in other words, an independent variable is a linear function of the other independent variables. To find out whether or not multicollinearity exists, among others, is a zero-degree correlation matrix. Tolerance and VIF values are used to determine whether there is multicollinearity in the research model. Heteroscedasticity is the presence of an unequal variance of the residuals for all observations in the regression model. Heteroscedasticity causes an estimator to no longer have a minimum variance if we use the OLS method (Damodar et al., 2009). The explanation of the results of multiple linear regression estimation applying the classical assumptions can be seen in table 2.

### 3 Result and discussion

Variables used in research were selling price as dependent variable and independent variables were the knowledge of farmers about konjac, the exported commodity to China, then noted as China Import. The others variable was Altitude; Processed Konjac in the form of tuber, chip, or flour; Land Area; Farming System, Education, and Accessing News. The selling price of konjac by farmer reached maximum price was IDR15,000 and IDR2,500 at the minimum price. Farmers cultivated konjac at 428.75 MASL in average. The highest area that was used for cultivation was 670 MASL located in Pangandaran, West Java.
Farmers dominantly planted konjac using multiculture system. The farming system was notated by dummy variable that was 1 depicted the multiculture system. Farmers located in upland, Pangandaran West Java, were seldom accessed news on internet because of the electricity often off, one or twice in a day.

Table 1. Descriptive statistics of variables of konjac price fluctuation analysis

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Selling Price</th>
<th>China Import</th>
<th>Altitude (MASL)</th>
<th>Processed Konjac</th>
<th>Land Area</th>
<th>Storage Time</th>
<th>Farming System</th>
<th>Education Accessing News</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>78</td>
<td>41.667</td>
<td>0.91666</td>
<td>28.750</td>
<td>0.05000</td>
<td>19.0</td>
<td>81.666</td>
<td>7.0</td>
</tr>
<tr>
<td>Median</td>
<td>70</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>8.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Maximum</td>
<td>15</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>1.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Minimum</td>
<td>25</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>1.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>28</td>
<td>48.567</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000</td>
<td>1.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.78384</td>
<td>0.78384</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>1.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.70491</td>
<td>3.70491</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>1.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>7.38640</td>
<td>7.38640</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>4.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Probability</td>
<td>0.09489</td>
<td>0.09489</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>5.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Sum</td>
<td>47.0500</td>
<td>47.0500</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>1.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Sum Sq. Dev.</td>
<td>4.79E+08</td>
<td>4.79E+08</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>2.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Observation</td>
<td>60</td>
<td>6.0</td>
<td>0.0</td>
<td>6.0</td>
<td>0.0</td>
<td>6.0</td>
<td>0.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Source: Primary Data Analysis, 2022

The estimated model was defined using OLS, the data resulted normality that stated the non-significant value of Jarque-Bera and its probability. The indicator, Variance Inflation Factor (VIF) of variables, resulted value less than 10, therefore the estimated model free from multicollinearity. The heteroscedasticity did not occure because the test of White was
not significant. The autocorrelation was tested using serial correlation LM test, then the value was interpreted non-significant. The value of White and serial correlation LM test was more than alpha 0.05. R-squared estimation indicated the proper model of OLS because the value 0.472454. The interpretation of the R-squared value stated that the model could be explained by the independent variables reached 47% and 53% were explained by other variables that did not observe in the analysis. The R-square value also depicted the proportion of the total variation of the dependent variable that could be explained by the independent variables analysing in the research location.

**Table 2. Classical Assumption Test of Multiple Linear Regression Estimation**

<table>
<thead>
<tr>
<th>Classical Assumption Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normality</td>
<td>10.28903</td>
</tr>
<tr>
<td>Jarque-Bera Probability</td>
<td>2.173904</td>
</tr>
<tr>
<td>Multicollinearity (Variance Inflation Factors)</td>
<td></td>
</tr>
<tr>
<td>Knowled of Konjac as export commodity</td>
<td>1.263619</td>
</tr>
<tr>
<td>Altitude (MASL)</td>
<td>1.181663</td>
</tr>
<tr>
<td>Processed konjac</td>
<td>1.130025</td>
</tr>
<tr>
<td>Land area</td>
<td>1.093270</td>
</tr>
<tr>
<td>Storage time</td>
<td>2.417877</td>
</tr>
<tr>
<td>Farming system</td>
<td>1.087424</td>
</tr>
<tr>
<td>Education</td>
<td>1.059108</td>
</tr>
<tr>
<td>Hours of accessing news</td>
<td></td>
</tr>
<tr>
<td>Heteroscedasticity (White)</td>
<td>0.957300</td>
</tr>
<tr>
<td>Autocorrelation (serial correlation LM test)</td>
<td>0.859600</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.472454</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.389702</td>
</tr>
<tr>
<td>F-statistic</td>
<td>5.709264</td>
</tr>
<tr>
<td>Prob.(F-statistic)</td>
<td>0.000034</td>
</tr>
</tbody>
</table>

Source : E-views output analysis, 2022

**Table 3. Estimation of Multiple Linear Regression**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>16869.83</td>
<td>0.0000***</td>
</tr>
<tr>
<td>Knowled of konjac as export commodity</td>
<td>-4143.635</td>
<td>0.0089***</td>
</tr>
<tr>
<td>Altitude (MASL)</td>
<td>-4.507454</td>
<td>0.0996*</td>
</tr>
<tr>
<td>Processed konjac</td>
<td>4122.029</td>
<td>0.0059***</td>
</tr>
<tr>
<td>Land area</td>
<td>0.062886</td>
<td>0.6239</td>
</tr>
<tr>
<td>Storage time</td>
<td>-193.1220</td>
<td>0.0717*</td>
</tr>
<tr>
<td>Farming system</td>
<td>4.998590</td>
<td>0.9968</td>
</tr>
<tr>
<td>Education</td>
<td>-313.2297</td>
<td>0.0010***</td>
</tr>
<tr>
<td>Hours of accessing news</td>
<td>398.5129</td>
<td>0.1177</td>
</tr>
</tbody>
</table>

Source: Primary Data Analysis, 2022

*** : significant at 99% (alpha 0.01)

** : significant at 95% (alpha 0.05)

* : significant at 90% (alpha 0.10)
The results of multiple linear regression of selling price estimation that was exposed in Table 3. stated the variables knowledge of export commodity, elevation of farming location, processed konjac in tubers or chips, storage time, and education had significant impacts on konjac price that was sold by farmers. Farmers' knowledge of export commodities, konjac processing sold, and education level had significant effect on the alpha level 0.01. Variable location of the height of the location of farming and storage time after harvest have a significant effect on the alpha level of 0.05. Variables of farmer's knowledge of konjac as an export commodity, height of farming location, storage time, and farmer's educational level have a negative effect on the selling price of konjac by farmers, while the shape of the konjac sold has a positive effect on the selling price of konjac.

### 3.1 Konjac as export commodity

Farmers who are aware that konjac is an exported commodity benefit from price cuts of up to IDR 4,143,635. Farmers who have planted konjac since 2017 have high expectations because they have realized that konjac is very valuable in the international market. Farmers are motivated to engage in konjac farming because there is a factory that accepts and exports their harvest. Farmers' interest in planting konjac is influenced by their expectations about the certainty of results that are absorbed by local and international markets. Farmers who are aware that konjac is an export commodity and that most exports are destined for China usually obtained this information directly from middlemen. Farmers continue to follow middlemen-set prices because most farmers find it difficult to reach cities to sell directly to wholesalers or processing plants. Farmers received the middlemen's advice to release konjac at a low price, as well as information on the barriers to konjac entry from Indonesia to China. Farmers become concerned if the crop is not fully absorbed during harvest, so they sell konjac at a low price in order to avoid hoarding konjac at home. China absorbs 80% of the total konjac that can be produced by absorbing konjac from Indonesia. China suspended Indonesian konjac exports on June 1, 2020, and imposed inspection and quarantine protocols on November 28, 2021, with exports resuming in June 22. Indonesian konjac production is considered not in line with the Food Safety Law of The People's Republic of China, so it is not allowed enter the Chinese market. The export barriers imposed by China through the GACC provide an opportunity for Indonesian konjac products to improve quality in the coming period and gain international recognition. Food safety testing is critical in China for products entering the country. Because the history of konjac seed origin and cultivation methods is important for China, the history of seed origin and seed handling must be traced. Most porang markets are monopsony, meaning that there are many farmers and few buyers or exporters, so prices are easily determined by buyers and there is a risk of farmer competition [18].

### 3.2 Altitude

The higher the location for konjac farming, the lower the selling price, which reaches IDR 4,507,454. There are 30 farmers in Pangandaran Regency, West Java who cultivate konjac above 500 MASL, while 30 farmers in Purworejo Regency, West Java, do konjac farming below 500 MASL. The average elevation of cultivation sites in Pangandaran Regency is 540 MASL, while it is 318 MASL in Purworejo Regency. The majority of konjac cultivation locations in Pangandaran Regency are in hilly areas, with simpler cultivation and processing techniques than farmers in the lowlands, specifically in Purworejo Regency. Because of the long distance between the farmer's home and the farm equipment shop, cultivation in the
highlands is rarely done by applying chemical fertilizers to the soil on a regular basis. Farmers do not raise livestock and thus do not generate manure. Soil that has not been fertilized with manure is less fertile than soil that has been fertilized with manure. Farmers who live in rural areas are less likely to buy certified seeds from farming equipment stores due to time constraints and transportation issues. Because transportation costs can increase farming expenses, farmers are often forced to use seeds from previous crops. The use of seeds from non-certified harvests increases the risk of the next harvest being less plentiful and of lower quality. Because there is no technology for processing konjac tubers after harvest in the highlands, farmers' bargaining power over konjac prices is extremely low. Due to the scarcity of supporting facilities and equipment in the highlands, the process of transporting and shipping equipment is hampered by uneven road conditions. Electricity is limited in the highlands research area of Pangandaran Regency, such as in Langkap Lancar Subdistrict, and there are several power outages in a single day.

Commodity cultivation in mountainous areas typically relies on rainwater, with the risk of decreasing soil fertility after three consecutive years of planting and then shifting to other, more fertile locations [19]. Low temperatures in the highlands cause the reproduction process to take longer than in the lowlands [20]. Purworejo's (lowland area) climate is classified as tropical. Purworejo receives significant rainfall throughout the year, with only a brief dry season. The prevailing climate in this region is classified as Am by the Köppen-Geiger classification. The highest average temperature is in April, at 25.1 °C | 77.2 °F. At 23.4 °C | 74.1 °F on average, 2426 mm of precipitation | 95.5 inches per year. Pangandaran (highland) climate Pangandaran receives significant rainfall, even during the driest months. According to the Köppen-Geiger climate classification, the climate in Pangandaran's highlands is Af. The lowest temperature reaches 22 °C | 71.6 °F. In a year of rainfall 2523 mm | 99.3 inches [21]. According to [22], rainfall and light intensity in the lowlands have a better effect on canopy development and the accumulation of tuber biomass.

3.3 Processed konjac sold by farmers

Farmers sell konjac in the form of tubers and chips, so the form variable is a dummy variable. According to the findings of the OLS analysis, selling konjac in the form of chips can increase the selling price by up to IDR 4,122,029. The presence of a konjac processing factory in the lowlands encourages farmers to adopt technology to prevent a decrease in the quality of the konjac harvest that is sold to factories and wholesalers. China is more interested in receiving konjac processed products with low water content because they are more resistant to mold and disease damage. The chips are an attempt to increase the economic value of the konjac. The form of chips is an effort to increase the economic value of the konjac crop. Based on research [23], drying in the form of chips can reduce the activity of microorganisms, lighten the color, and make shipping easier. The microwave vacuum drying method and temperature of the chips can reduce particle density and increase product porosity [24].

3.4 Storage time

The results of the OLS analysis show that the longer the harvested konjac is stored, the lower the selling price. The selling price of konjac has the potential to fall to IDR 193,1220 for every additional day of storage. After harvest, the stage of the konjac tuber storage process determines the quality of the konjac that will be sold. Harvested konjac tubers that
are stored for an extended period of time lose quality and are susceptible to fungal and viral contamination, making the tubers prone to decay. The storage process is critical to monitor because it is where observations and contamination checks are performed prior to export. Thus, observation and inspection actions need to be carried out quickly before the konjac quality decreases due to too long storage time. The explanation of [25] stated that tubers experienced respiration during storage, which could result in reduced dry part of flour formation. Because water is gradually lost during the transpiration process, the weight of the tubers decreases [26]. The research of [27] states that the maximum storage time for konjac tubers to avoid decay is no more than five weeks after harvest.

Growing konjac is best in areas with low humidity until the humidity is dry. Konjac tubers rot easily if there is excessive water in the storage area. Stacking the bulbs reduces sunlight and raises humidity levels. Konjac seeds play an important role in the growth of konjac tubers and the harvest success rate. A good seed crop is one that is harvested after the konjac plant has gone dormant, or when it is dormant in the form of a frog (bulbil) or tubers. Because the moisture content is still high, seeds harvested before the dormant period are susceptible to rot. Because the konjac growth period occurs during the rainy season, the konjac seed planting stage arises during the dry season, which is one or two months before the rainy season. Harvesting konjac tubers after the konjac plants have gone dormant and leaving them in the soil for at least two months after the dormant plant period, allowing the plant roots to detach naturally from the tubers. This treatment is applied to tubers for harvesting as well as tubers for seed production. Good harvest according to [28], tubers that have completed the fourth growth period, because the larger the tuber diameter, the greater the tuber weight, thus produced the higher the glucomannan content. When the plant starts to fall, it has a high glucomannan content [29], [30].

3.5 Education level

The variable farmer's education level has a negative effect on the selling price; specifically, the higher the farmer's education, the cheaper the konjac price sold is compared to the konjac price sold by other farmers. The selling price of the konjac harvest fell to IDR 313,297. The elderly dominates the konjac farmer category because they have been cultivating the konjac plant since Indonesia's pre-independence period. The average old konjac farmer has an elementary school level of education (SD) or less than six years of education and has consumed konjac since childhood. Farmers are advised not to dry konjac flakes in the sun because they must be processed using a drying machine. If konjac is to be exported to China, land used for cultivation must be registered. Older farmers are less able to adapt to and comply with China's regulations [31]. Farmers with a higher education are more likely to be able to carry out farming efficiency in terms of farming cost management. Efforts to reduce costs are made by using high-quality seeds to avoid crop failure. The higher the level of education, the more understanding of the development of the konjac export market, so that costs are adjusted to the konjac selling price. Based on research [32], konjac in the export supply chain tends to experience the dominance of processing companies and exporters.

4 Conclusions

Farmers experienced uncertainty over the price of konjac due to the impact of China's suspension of imports of konjac. Middlemen also determined the purchase price of konjac to farmers because of the role of middlemen as intermediaries between farmers and the
konjac processing industry. Most farmers were unable to process konjac according to the demand of konjac importing countries, one of which has been China. Farmers who planted konjac in the highlands tend to be less innovative and have not been selected superior seeds due to limited equipment and the distance from industrial konjac processing companies. Farmers who were unable to complete export requirements find it easier to release their harvested konjac in the form of tubers at a lower price. Konjac processing was very necessary so that the water content was reduced, so it was not easily damaged by bacteria and virus, for example into chips, flour, sirataki rice, gelatin, and noodles. Processed konjac has added value at a higher price than konjac in tuber form. One of indicators of SDGs is end poverty that has been strived by konjac as the commodity having added value. Farmers might obtain high income from export activity. However, the cultivation and marketing system must be developed, thus they have ability to comply the international standards.

References


