PRODUCER PRICE INDEX METHODOLOGY

TANZANIA MAINLAND

2019

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1.0 Introduction

National Bureau of Statistics (NBS) is the main organization responsible for collecting statistics to support evidence-based decision making in Tanzania, as stipulated in Statistics Act Cap. 351. NBS plays a key role in coordinating the National Statistical System, ensuring data quality, and maintaining statistical standards. It conducts national censuses, surveys, and economic reports that guide government planning, policy development and monitoring.

The methodology for developing Producer Price Index in Tanzania is a complement to the International Producer Price Index Manual (PPI Manual) published by the IMF in 2004. The purpose of this methodology is to provide a technical experience of how to compile PPI and disseminate it regularly. IMF AFRITAC provide a technical assistance project in Tanzania to build the country's statistical capacity in the PPI compilation.

The concepts and definitions used are consistent with international standards, specifically the *2008 System of National Accounts (SNA),* which provides a comprehensive framework for compiling national accounts, and the *2004 Producer Price Index Manual: Theory and Practice,* which offers detailed guidelines for the compilation and interpretation of producer price indices to ensure comparability and reliability of economic data.

1.1 Definition of PPI

The Producer Price Index (PPI) measures the average change over time in the prices received by selected domestic producers for the sale of their goods and services at the first point of transaction. It serves as a key indicator of inflation at the production level and helps in analyzing price trends in various sectors of the economy. The index is compiled using a representative basket of selected commodities, which reflects the structure of domestic production. These commodities are carefully chosen based on their economic significance and are priced on a quarterly basis to ensure accurate and timely tracking of price movement.

1.2 Uses of PPI

The Producer Price Index (PPI), is an important indicator of economic performance that provides information for economic policy making used by stakeholders to gauge industrial performance and to forecast future economic performance. Many countries compile PPI, as it is one of the warning indicators of short-term economic development. Also, it is used to identify the turning points in economic development at an early stage.

2.1 Scope and Coverage

The scope of the Producer Price Index (PPI) encompasses key sectors of the economy, including mining and quarrying; manufacturing; and utilities which consist of electricity, gas, steam and air conditioning supply, as well as water supply, sewerage, waste management, and remediation activities. The PPI covers both local and export markets, capturing price changes at the first point of commercial transaction, while excluding taxes, subsidies, and transportation costs, to reflect pure producer price movements.

The industry classification used in the compilation of the index aligns with the International Standard Industrial Classification of All Economic Activities, Revision 4 (ISIC Rev. 4), ensuring international comparability. Data for the PPI are collected from selected establishments across the country, representing a wide range of producers in the covered sectors.

The index is calculated based on a fixed basket of representative products, selected according to their economic relevance and stability in the market. A designated base year is used as a reference point for measuring relative price changes over time, allowing for consistent tracking and analysis of producer price trends.

3.1 Structure, Composition and Weighting of the Index

The structure and weighting pattern of the Producer Price Index (PPI) were derived from the 2015 Annual Survey of Industrial Production, using gross output data as the primary source. The methodology employed a top-down approach to develop the index structure, determine the weights, and select the product basket. Once the approach was finalized,

a fixed basket of representative products was chosen, and 2015-based weights were calculated accordingly.

3.1.1 Sampling

A cut-off sampling method was used to select a sample of establishments for inclusion in the price survey. This method ensures that only establishments contributing significantly to total production are included, thereby improving efficiency and representativeness in data collection.

The top-down approach was specifically adopted to maximize the indirect representation of industries and products within the index. In this approach, relatively minor industries were progressively excluded at successive levels of industry aggregation (i.e., at the 1-digit, 2-digit, 3-digit, and 4-digit ISIC Rev. 4 classification levels). However, even with these exclusions, the full relative value of aggregate outputs at each level was retained. This ensures that excluded industries still contribute to the overall weighting structure.

At the 4-digit class level of ISIC, the prices of selected commodities that are directly priced serve as proxies or indicators for related industries within the same classification level that are not directly priced. The rationale behind this method is that unpriced items are more likely to exhibit similar price movements to closely related products than to dissimilar ones, thereby preserving the integrity and relevance of the index while maintaining a manageable data collection process.

3.1.2 Rules for Weights Derivation

The following general rules were applied in the derivation of weights for the Producer Price Index (PPI), using a top-down approach:

i. At the 1-digit section level of ISIC, relatively minor 2-digit Divisions typically those contributing less than 5% to the total gross output of the section (subject to variation based on the degree of industry concentration) were excluded from direct inclusion.

ii. The gross output values of the excluded 2-digit industries were proportionally redistributed (prorated) among the selected industries within the same section, ensuring the retention of the section's full weight in the index.

iii. The same elimination and proration process was applied at the 3-digit Group level, with relatively small industries being progressively excluded.

iv. The procedure was further repeated at the 4-digit Class level, where directly priced items were used as proxies for related but unpriced items within the same class.

v. The final weighting pattern was expressed in percentage terms, representing each industry's contribution to the total weighted output used in the index calculation.

It is important to note that, during the process of eliminating relatively small industries at successive levels of the ISIC classification structure, discretion was applied to account for several important factors. These included:

i. Recognizing emerging and growth industries that, while currently small, are expected to expand significantly during the life cycle of the PPI before its next rebase;

ii. Selectively retaining unique industries or products whose price movements are not likely to be adequately represented by those of other, more general industries or products;

iii. Ensuring higher direct coverage within dominant divisions to improve the representativeness and reliability of the index.

4.1 Activities (ISIC Classes) and Establishments for Price Collection

4.1.1 Selection of ISIC Classes

The 4-digit ISIC classes were selected to represent each of the remaining 3-digit ISIC groups after the elimination of relatively small industries. These selected classes are the industries for which price indicators were directly collected from a sample of producer establishments. The selected 4-digit industries not only represent themselves but also indirectly represent the excluded industries, whose weights were reallocated using the top-down allocation approach described above.

4.1.2 Selection of Establishments

For the purpose of weight computation, a total of 2,389 establishments from the 2015 Annual Survey of Industrial Production were initially considered. Within each ISIC Rev.4 group, establishments contributing at least 80 percent of gross output were selected to ensure the sample accurately reflects the industry's production value.

From this process, a final sample of 201 establishments was selected for inclusion in the Producer Price Index, broken down as follows:

- 7 establishments representing mining and quarrying,
- 186 establishments representing manufacturing, and
- 8 establishments representing utilities.

These establishments collectively covered:

- 68 activities at the 4-digit ISIC level,
- 48 activities at the 3-digit ISIC level, and
- 27 activities at the 2-digit ISIC level.

Under this top-down reallocation methodology, the price movements of unpriced industries are assumed to be broadly represented by the price trends of similar priced industries. This approach helps maintain the comprehensiveness and accuracy of the index while keeping the data collection process efficient.

4.2 Criteria for Selecting Sampled Products

The following criteria were applied to ensure that the sampled products accurately reflect producer price movements and maintain consistency over time:

i. Representativeness: Sampled products are representative of a broader range of products within each industry in terms of price behavior over time;
ii. Economic Significance: The selected products are typically the producer's highest-selling items in terms of value, ensuring their economic relevance;
iii. Regular Availability: Products are regularly produced and sold, allowing for consistent and reliable price tracking;
iv. Coverage: Three products were selected to represent each ISIC class from each producer. However, where necessary due to product diversity or market segmentation a larger number of products was selected to ensure adequate representation; and
v. Detailed Specification: A complete specification of each sampled product was recorded, including all characteristics that influence its price. This includes: physical attributes (e.g., size, quality, packaging), Unit of measurement, transaction details, ensuring consistent product quality over time and accurate measurement of price change.

4.3 Aggregation formula and compilation methodology

4.3.1 Elementary Aggregates Indices

The compilation of the Producer Price Index (PPI) follows a multi-level aggregation approach, starting from the most detailed level of classification. The first level of aggregation occurs at the 4-digit ISIC class level, where elementary aggregate (EA) indices are compiled. These EA indices are unweighted and calculated using the Jevons aggregation formula, which is the geometric mean of price relatives. This method is appropriate for capturing relative price changes without the influence of weights at this lowest level.

Example of Elementary aggregates Index four-digit level

ISIC Level 4	Name of Establishment	Products	Unit	2018Q4	2019Q1	2019Q2	2019Q3	2019Q4	
0810	V	Chipping	CUBIC METER	13,000	13,450	13,550	13,550	13,550	
0810	W	Aggregate	CUBIC METER	37,500	37,500	38,500	38,500	38,500	
0810	X	Stone	TON	16,000	16,000	16,500	16,500	16,500	
0810	Y	Aggregate	TON	30,000	31,000	31,500	31,500	31,500	
0810	Z	Chipping	TON	13,300	12,500	13,500	13,500	13,500	
0810	U	Dust	TON	15,000	15,000	15,000	15,000	15,000	
				1.00	1.03	1.04	1.04	1.04	
				1.00	1.00	1.03	1.03	1.03	
		Price Relatives		1.00	1.00	1.03	1.03	1.03	
				1.00	1.03	1.05	1.05	1.05	
				1.00	0.94	1.02	1.02	1.02	
				1.00	1.00	1.00	1.00	1.00	
0810	**Quarrying of stone, sand and clay**			**100.00**	**100.08**	**102.74**	=GEOMEAN(J21:J26)*100		**A**
0893	M	Salt	TON	269,674	269,674	278,689	270,170	270,170	
0893	N	Salt	TON	236,868	236,868	236,868	237,288	237,288	
0893	O	Salt	TON	89,500	89,500	89,500	89,500	89,500	
				1.00	1.00	1.03	1.00	1.00	
				1.00	1.00	1.00	1.00	1.00	
				1.00	1.00	1.00	1.00	1.00	
0893	**Extraction of salt**			**100.00**	**100.00**	**101.10**	**100.12**	**100.12**	**B**

A and B are Elementary Indices

4.3.2 Higher Level Indices

Once the elementary indices are compiled, they are progressively aggregated to higher classification levels which includes 3-digit ISIC group, 2-digit ISIC division, 1-digit ISIC section, and finally, the overall (all-groups) index.

At these higher levels, aggregation is performed using the Laspeyres formula, a base-weighted index formula that applies fixed weights derived from the base year (2015). This method ensures that each industry's contribution to the index reflects its relative economic importance during the base period.

Examples of higher-level Index two-digit level

ISIC Level 3	Activity description	Weight	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4
081	Quarrying of stone, sand and clay	0.2	100.00	100.08	102.74	102.74	102.74
089	Mining and quarrying n.e.c.	3.1	100.00	100.00	101.10	100.12	100.12
08	**Other mining and quarrying**	**3.4**	**100.00**	**100.01**	**101.21**	=((R21*$N21)+(R22*$N22))/$N23	

Elementary Indices combined with weights to form higher level indices

Examples of Overall (total) Index

ISIC Section	Industrial Activity	Weight (%)	2018Q4	2019Q1	2019Q2	2019Q3	2019Q4
B	Mining and Quarrying	19.08	100.0	122.2	122.8	123.4	123.9
C	Manufacturing	62.80	100.0	98.3	97.0	97.8	100.2
D & E	Utility	18.12	100.0	100.0	100.1	101.8	101.8
	Overall Index	**100.00**	**100.0**	**103.2**	=((G3*D3)+(G4*D4)+(G5*D5))/D6		

higher level Indices combined with weights to form Overall indices

4.4 Periodicity and Frequency of Rebasing of the Indices

The Producer Price Index (PPI) is compiled on both a quarterly and annual basis, in order to monitor short- and medium-term trends in producer prices. The quarterly indices provide timely insight into price movements at the production level, allowing for more frequent analysis of inflationary pressures across key sectors. The annual indices are derived as the simple arithmetic average of the four quarterly indices within a given calendar year, offering a broader view of price trends over time and smoothing out short-term fluctuations that may occur due to seasonal or temporary market conditions

A key feature of the PPI is that it is published with a broad industry breakdown, specifically at the 2-digit Division level of the International Standard Industrial Classification (ISIC Rev. 4). The quarterly indices are released six weeks after the end of the reference quarter, allowing timely access to price data at an industry level. The initial set of indices was compiled for the December 2018 quarter, and the series has since been progressively extended each quarter to maintain continuity and coverage.

In line with international statistical standards, the PPI is planned to be rebased every five years. The rebasing process uses the most recent finalized data from either the Annual Survey of Industrial Production (ASIP) or the Census of Industrial Production (CIP). During this process, the ISIC-based industry values used in the PPI are revalued to reflect prices in the new reference base period, ensuring that the index remains relevant and reflective of current production structures and pricing dynamics.

4.5 Data Collection and Pricing Point

A timely mid-quarter collection of producer prices is essential to compile a Producer Price Index (PPI) that complies with IMF Data Dissemination Standards (DSDS). This timely data enables policymakers to receive an early indicator of downstream household inflation and supports the accurate calculation of contemporary national accounts volume estimates, thus facilitating informed economic decision-making.

4.5.1 Data Collection Procedure

Price data collection is conducted using paper-based questionnaires distributed to selected establishments. Field interviews are carried out by trained enumerators who operate under the supervision of regional office staff to ensure data quality and consistency. Upon completion, the filled questionnaires are forwarded by mail to the National Bureau of Statistics (NBS) headquarters for processing and compilation.

4.5.2 Point in Time Pricing

The pricing point is set as the 15th day of the middle month of each quarter, or, if this falls on a non-trading day, the nearest previous trading day or the nearest previous day on which a transaction occurred. This pricing point is referred as point in time. Prices are collected at the ex-mine or ex-factory level, using a valuation basis of basic prices, which excludes trade and transport margins as well as value-added tax (VAT). This approach ensures that the index reflects pure producer price movements without downstream distribution costs or taxes.

4.5.3 Key issues for Product Pricing During Data Collection

Interviewers must carefully observe the following guidelines when collecting product prices to ensure accuracy and consistency:

i. Use actual transaction prices recorded at the basic price level (e.g., ex-mine, ex-factory), which means prices should exclude trade and transport margins, as well as value-added tax (VAT);
ii. Prices should ideally reflect those as of the 15th day of the middle month of

the quarter, or, if this date falls on a holiday, the nearest preceding trading day; and

iii. In cases where sales are infrequent, interviewers should select a transaction that occurred on a day as close as possible to, but not later than, the 15th of the middle month.

4.6 Price Data Editing and Analysis Procedures

4.6.1 Data Editing

Reported prices undergo a thorough editing process to ensure data accuracy and consistency. This includes:

i. Confirming reported price changes by verifying their validity and obtaining explanations for significant fluctuations.

ii. Reviewing any price movements linked to changes in product specifications or other quality adjustments to avoid capturing quality-driven price effects as pure price changes.

iii. Comparing price changes across different product specifications within the same establishment, as well as between establishments classified under the same elementary aggregate, to identify inconsistencies or anomalies.

Outliers, defined as price increases of 5% or more, are carefully scrutinized, and any price decreases are verified with respondents. Data are then edited accordingly, with credible reasons documented for any adjustments made.

4.6.2 Producer Price Index Analysis

The analysis of the Producer Price Index (PPI) focuses on identifying the key drivers behind price changes over the last quarter and the previous year. This involves determining which industry groups or product classes referred to as main moving aggregates contributed most significantly to the observed index movements. By assessing both the magnitude of price change and the relative weight of each aggregate, the analysis

reveals their contribution to upper-level indices and the overall PPI. This helps to distinguish between short-term fluctuations and long-term trends.

4.7 Quality Adjustment

To ensure that prices reflect constant quality, the direct comparison method and expert judgment are commonly employed during the data editing phase of PPI compilation. These methods help isolate pure price movements from those caused by changes in product specifications or quality. Direct Comparison Method is used when the replacement product is identical or nearly identical to the previously priced item and expert judgment is applied when there are observable quality changes, but quantifiable data on the value of the change is lacking. If quality changes are not identified and adjusted, the index may reflect value differences rather than actual price changes, compromising its accuracy and reliability.

4.8 Treatment of Missing Prices

Consistent and standardized statistical methods are applied to address missing price data, whether due to temporary unavailability or seasonality of the product. Proper handling of missing prices is essential to maintain the continuity and accuracy of the Producer Price Index (PPI).

4.8.1 Temporarily Missing Prices

When a price is temporarily unavailable, imputation is generally based on the price movement of similar products. Preferably, imputation is done using the price changes of similar products sold by the same establishment. If not available, data from other comparable establishments are used. In cases where the product historically exhibits stable pricing patterns (e.g. changes once annually), the last reported price may be carried forward.

4.8.2 Missing Prices for Seasonal Products

For seasonal items not sold year-round, prices are imputed using the price movement of comparable products that are in-season during the same period. These may include both

similar seasonal products and related items sold throughout the year. Importantly, even if a product is generally out-of-season, actual transactions may still occur; if so, these transaction prices are used in the index.

4.8 Conclusion

The Producer Price Index (PPI) is a vital economic indicator that measures average changes in prices received by producers for goods and services over time. Its accuracy depends on a sound methodological foundation, including consistent data collection, classification by industry, use of fixed-base weighting (Laspeyres), quality adjustment, and rigorous data validation. Maintaining constant quality, timely updates, and alignment with national accounts ensure that the PPI reflects true price movements. A well-constructed PPI supports informed decision-making for policymakers, businesses, and researchers, offering early signals of inflationary trends and contributing to effective economic planning and analysis.

4.9 Appendices

The following are Producer Price Index (PPI) weights based gross output data derived from 2015 Annual Survey of Industrial Production:

Appendix 1: PPI weights of ISIC Level Four

ISIC Level 4	Industrial activity description	Weight (%)
0729	Mining of other non-ferrous metal ores	15.7
0810	Quarrying of stone, sand and clay	0.2
0893	Extraction of salt	0.0
0899	Other mining and quarrying n.e.c.	3.1
1010	Processing and preserving of meat	0.4
1020	Processing and preserving of fish, crustaceans and molluscs	1.7
1030	Processing and preserving of fruit and vegetables	1.9
1040	Manufacture of vegetable and animal oils and fats	4.3
1050	Manufacture of dairy products	0.2
1061	Manufacture of grain mill products	5.1
1071	Manufacture of bakery products	0.5
1072	Manufacture of sugar	2.3
1079	Manufacture of other food products n.e.c.	2.8
1080	Manufacture of prepared animal feeds	0.3
1101	Distilling, rectifying and blending of spirits	1.2
1102	Manufacture of wines	0.5
1103	Manufacture of malt liquors and malt	4.6
1104	Manufacture of soft drinks; production of mineral waters and other bottled waters	5.7
1200	Manufacture of tobacco products	3.3
1312	Weaving of textiles	1.2
1313	Finishing of textiles	0.1
1391	Manufacture of knitted and crocheted fabrics	1.4

1394	Manufacture of cordage, rope, twine and netting	0.5
1410	Manufacture of wearing apparel, except fur apparel	0.1
1420	Manufacture of articles of fur	0.0
1512	Manufacture of luggage, handbags and the like, saddlery and harness	0.2
1520	Manufacture of footwear	0.1
1610	Sawmilling and planing of wood	0.9
1622	Manufacture of builders' carpentry and joinery	0.0
1623	Manufacture of wooden containers	0.1
1629	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	0.3
1702	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	0.2
1709	Manufacture of other articles of paper and paperboard	2.1
1811	Printing	1.2
1812	Service activities related to printing	0.0
1820	Reproduction of recorded media	0.0
1920	Manufacture of refined petroleum products	0.3
2011	Manufacture of basic chemicals	0.2
2012	Manufacture of fertilizers and nitrogen compounds	0.0
2022	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	0.8
2023	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	1.9
2029	Manufacture of other chemical products n.e.c.	0.0
2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products	0.4
2219	Manufacture of other rubber products	0.0
2220	Manufacture of plastics products	2.6
2310	Manufacture of glass and glass products	1.0

2392	Manufacture of clay building materials	0.1
2394	Manufacture of cement, lime and plaster	3.9
2395	Manufacture of articles of concrete, cement and plaster	0.7
2399	Manufacture of other non-metallic mineral products n.e.c.	0.0
2410	Manufacture of basic iron and steel	3.1
2420	Manufacture of basic precious and other non-ferrous metals	0.1
2511	Manufacture of structural metal products	0.0
2512	Manufacture of tanks, reservoirs and containers of metal	0.1
2593	Manufacture of cutlery, hand tools and general hardware	0.0
2599	Manufacture of other fabricated metal products n.e.c.	0.2
2610	Manufacture of electronic components and boards	0.0
2732	Manufacture of other electronic and electric wires and cables	0.6
2750	Manufacture of domestic appliances	0.2
2825	Manufacture of metal-forming machinery and machine tools	0.0
2920	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	0.5
2930	Manufacture of parts and accessories for motor vehicles	0.1
3100	Manufacture of furniture	2.3
3211	Manufacture of jewellery and related articles	0.2
3290	Other manufacturing n.e.c.	0.4
3319	Repair of other equipment	0.1
3510	Electric power generation, transmission and distribution	16.9
3600	Water collection, treatment and supply	1.2
	Total	**100.0**

Appendix 2: PPI weights of ISIC Level Three

ISIC Level 3	Industrial activity description	Weight (%)
072	Mining of non-ferrous metal ores	15.7
081	Quarrying of stone, sand and clay	0.2
089	Mining and quarrying n.e.c.	3.1
101	Processing and preserving of meat	0.4
102	Processing and preserving of fish, crustaceans and molluscs	1.7
103	Processing and preserving of fruit and vegetables	1.9
104	Manufacture of vegetable and animal oils and fats	4.3
105	Manufacture of dairy products	0.2
106	Manufacture of grain mill products, starches and starch products	5.1
107	Manufacture of other food products	5.6
108	Manufacture of prepared animal feeds	0.3
110	Manufacture of beverages	12.0
120	Manufacture of tobacco products	3.3
131	Spinning, weaving and finishing of textiles	1.3
139	Manufacture of other textiles	1.8
141	Manufacture of wearing apparel, except fur apparel	0.1
142	Manufacture of articles of fur	0.0
151	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur	0.2
152	Manufacture of footwear	0.1
161	Sawmilling and planing of wood	0.9
162	Manufacture of products of wood, cork, straw and plaiting materials	0.4
170	Manufacture of paper and paper products	2.2
181	Printing and service activities related to printing	1.2
182	Reproduction of recorded media	0.0
192	Manufacture of refined petroleum products	0.3

201	Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms	0.2
202	Manufacture of other chemical products	2.8
210	Manufacture of pharmaceuticals, medicinal chemical and botanical products	0.4
221	Manufacture of rubber products	0.0
222	Manufacture of plastics products	2.6
231	Manufacture of glass and glass products	1.0
239	Manufacture of non-metallic mineral products n.e.c.	4.7
241	Manufacture of basic iron and steel	3.1
242	Manufacture of basic precious and other non-ferrous metals	0.1
251	Manufacture of structural metal products, tanks, reservoirs and steam generators	0.1
259	Manufacture of other fabricated metal products; metalworking service activities	0.3
261	Manufacture of electronic components and boards	0.0
273	Manufacture of wiring and wiring devices	0.6
275	Manufacture of domestic appliances	0.2
282	Manufacture of special-purpose machinery	0.0
292	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	0.5
293	Manufacture of parts and accessories for motor vehicles	0.1
310	Manufacture of furniture	2.3
321	Manufacture of jewellery, bijouterie and related articles	0.2
329	Other manufacturing n.e.c.	0.4
331	Repair of fabricated metal products, machinery and equipment	0.1
351	Electric power generation, transmission and distribution	16.9
360	Water collection, treatment and supply	1.2
	Total	**100.0**

Appendix 3: PPI weights of ISIC Level Two

Appendix 4: PPI weights of ISIC broader sectors

Sectors	Industrial Activity	Weight (%)
B	Mining and Quarrying	19.1
C	Manufacturing	62.8
D & E	Utility	18.1
	Total	**100.0**

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