

## Original Research Article

# Impact of Agricultural Price Policy on Main Crops in Egypt

### ABSTRACT

Agricultural production, like other economic activities, is affected by the success of agricultural economic policies pursued by government from leaving the farmer free to cultivate his land with the desired crops, and to take his production and marketing decisions in light of the mechanisms of supply and demand and the movement of prices in the markets without any intervention by the government. Therefore, the government's intervention influences the farmers' desire to grow any of the crops through its agricultural policies by imposing taxes or subsidizing inputs. Wheat, maize, rice, and potatoes are among the most crucial strategic food and industrial crops in Egypt. The Policy Analysis Matrix (PAM) can be calculated by calculating nominal and effective protection coefficients, and then identifying the policy adopted by the government, whether it is a protectionist policy or a policy of direct or indirect taxes on the producers of those crops, as well as the calculation of the cost of domestic resources to determine the relative advantage. The results showed that the financial value of workers' wages in the production of wheat, maize, rice, and potatoes at market prices exceeded the border prices, while the values of the nominal protection coefficients of outputs were about 0.81, 0.81, 0.80, 0.83 for wheat, maize, rice, and potatoes respectively. Nominal protection coefficient values for production inputs were 0.83, 0.83, 0.85, and 0.84 respectively for the four crops, while the effective protection plant values for wheat, maize, rice, and potato crops were 0.80, 0.80, 0.80 and 0.84, respectively. The values of the comparative advantage of the four crops, respectively, were 0.49, 0.52, 0.38, and 0.37.

**Comment [AM1]:** The data collection methods were not included. The recommendationa were also not included in the abstract.

**Keywords:** Policy Analysis Matrix, Nominal Protection Coefficient, Effective Protection Coefficient, Domestic Resource Costs.

### 1. INTRODUCTION

As Egypt progressed from a largely agricultural country to a country with a more diverse economy, agriculture itself slowly declined in prominence as a pillar of the Egyptian economy. Trends in the contribution of agriculture to national income give an indication of this. Between 1970 and 2000, agriculture's contribution had fallen from 29.0 to 16.5 percent of GDP, with output falling at an annual average of 2.8 percent between 1960 and 1980 [1,2]. This slow progress is also reflected in high unemployment and poverty levels. Nevertheless, today, agriculture is still expected to generate hard currency revenue via high-quality products for export and to provide food security for the country's population via the cultivation of enough staple crops. That is, agriculture is to provide income, employment, and food for the Egyptian population [3].

**Comment [AM2]:** Pleaase use recent statistics.

**Comment [AM3]:** When? Be specific

**Comment [AM4]:** Please include references for these statements.

**Comment [AM5]:** What is actually meant by this?

**Comment [AM6]:** References shoul be provided here.

Cereal crops, mainly wheat, maize and rice, are staple food crops for many nations, especially in developing countries. They also play a strategic role in the policies of developed countries as they use such crops as a tool for practicing pressure on other countries. That is why most developing countries seek to achieve self-sufficiency in cereal crops. In Egypt, official statistics indicate that cereal production reached 22.37 million tons, while domestic consumption reached 47.47 million tons, indicating a gap of 25 million tons worth US\$ 4.3 billion. In 2017, self-sufficiency in cereals reached 47.12% [4].

In addition, cereal crops occupy an important position in Egypt's agriculture, either in terms of contribution to national income, or to resources, with cultivated land area estimated at 12.19 million acers representing

32 76% of total cropped area, estimated at 16.04 million acres [5]. Also, Vegetables crops occupy an important  
 33 position in Egypt's agriculture, either in terms of contribution to national income, or to resources, with  
 34 cultivated land area estimated at 1.88 million acres representing 11.72% of total cropped area [6].  
 35 Wheat, maize, rice and potatoes are major crops in Egypt, domestic wheat production declined from 9.34  
 36 million tons in 2016 to 8.42 million tons in 2017, down by 9.9%. In 2017, average per capita share of wheat  
 37 amounted to 163.9 kg/year and self-sufficiency rate amounted to 34.5%. While Maize production increased  
 38 from 7.17 million tons in 2016 to 7.66 million tons in 2017, average per capita share of maize amounted to  
 39 52.2 kg/year and self-sufficiency rate amounted to 46.10%. Rice production also declined from 5.31 million  
 40 tons in 2016 to 4.96 million tons in 2016, down by 10.2%. In 2017, average per capita share of rice  
 41 amounted to 38.7 kg/year and self-sufficiency rate amounted to 87.96%. Potatoes production also declined  
 42 from 5.02 million tons in 2016 to 4.84 million tons in 2017, average per capita share of potatoes amounted  
 43 to 25.4 kg/year and self-sufficiency rate amounted to 116.28% [7].

Comment [AM7]: Where are references?

44 The current research investigates the problems arising from impact of agricultural price policy in agricultural  
 45 production through adopting development strategies that aim to achieve free market economy [8] and  
 46 dependency on interaction between supply and demand forces as main pillar to raise efficiency of the  
 47 national economy and achieve the hoped for development, which all resulted in producers bearing the  
 48 burden of paying indirect taxes (implicit) due to price distortions resulting from imbalances between  
 49 domestic and international prices [9]. Such situation obstructs efforts exerted to achieve optimum economic  
 50 efficiency in domestic resources' use as well as the welfare of producers and consumers. As a result,  
 51 producers started choosing to cultivate other crops that are not subject to taxes and in the same time are  
 52 profitable [10].

Comment [AM8]: Ditto

53 Accordingly, the current research mainly aims at assessing the impact of agricultural price policy by  
 54 studying and analyzing the indicators that can be deduced from PAM, which can help identify trends of  
 55 agricultural policies implemented in the agricultural sector and measure the efficiency of economic  
 56 resources' use. In addition, to assess the impact of the implemented policy by measuring Nominal  
 57 Protection Coefficient for outputs and inputs, Effective Protection Coefficient and Comparative Advantage  
 58 Coefficient (Domestic Resource Cost Coefficient).

## 60 2. MATERIALS AND METHODS

61 To achieve the research objectives, the impacts of agricultural price policy will be assessed for main crops  
 62 in Egypt, as follows:

Comment [AM9]: Indicate those crops here.

### 64 2.1 Policy Analysis Matrix (PAM)

65 Policy analysis matrix is one of the most important modern methods used in policy analysis, where it helps  
 66 examine the impacts of government's intervention policies across different stages of the flow of goods,  
 67 which in turn helps assess and measure such policies' efficiency in achieving the hoped for objectives and  
 68 examine their impacts on producers, consumers and the macro-level economic conditions [11]. The set of  
 69 indicators that can be deduced from PAM can help identify trends of agricultural policies implemented in  
 70 the agricultural sector and measure the efficiency of economic resources' use [12]. PAM is usually built  
 71 using farm budget, including revenues and costs, which occur in the form of tradable inputs (production  
 72 inputs) and domestic resources (land and labor). In PAM, both revenues and costs are evaluated financially  
 73 (at market prices) and economically (at border prices) to assess the impact of the implemented policy by  
 74 measuring Nominal Protection Coefficient for outputs and inputs, Effective Protection Coefficient and  
 75 Comparative Advantage Coefficient (Domestic Resource Cost Coefficient). The general structure of PAM is  
 76 presented as follows:

Comment [AM10]: Include references

Comment [AM11]: Ditto

78  
 79 **Table 1: General Structure of Policy Analysis Matrix**

Total revenue	Total production input	Total cost of domestic			Net Revenue	Value Added
		Total labor	Total rent (land)	Total		

80

Financial prices	A	B	C	D	E	F	G
Economic prices	H	I	J	K	L	M	N
Policy impact	O	P	Q	R	S	T	U

82

83 **Nominal Protection Coefficient on Tradable Outputs (NPC<sub>O</sub>)<sup>(1)</sup>**: Nominal Protection Coefficient on Tradable  
84 Outputs provides a comparison between domestic and economic prices of outputs. It represents such kinds of  
85 protection or taxes that prevent equating domestic prices with border prices. It reflects the level of incentives or non-  
86 incentives offered to domestic farmers. It can be calculated as follows:

$$\text{NPC} = \frac{\text{A}}{\text{H}}$$

- 87 • NPC > 1 means that domestic prices are higher than border prices, indicating implicit subsidy for producers.  
88 • NPC < 1 means that domestic prices are lower than border prices, indicating that producers incur implicit taxes.  
89 • NPC = 1 means absence of intervention in price policy, as well as absence of protection.

90 **Nominal Protection Coefficient on Tradable Inputs (NPC<sub>I</sub>)<sup>(2)</sup>**: Nominal Protection Coefficient on Tradable Inputs  
91 is the ratio between domestic and economic prices of outputs:

$$\text{NPCI} = \frac{\text{B}}{\text{I}}$$

- 92 • NPCI > 1 means that the government subsidizes production inputs.  
93 • NPCI < 1 means that the government imposes taxes on inputs.  
94 • NPCI = 1 means lack of distortions in input prices.

95 **Effective Protection Coefficient (EPC)<sup>(3)</sup>**: Effective Protection Coefficient is an extension of the concept of the  
96 Nominal Protection Coefficient. However, it measures price distortions at the level of output and input markets, where  
97 it measures the net impact of economic policy on domestic output and input markets. It is the ratio of the value added  
98 (4) of a particular product in domestic market price to the value added in economic price:  
99

$$\text{EPC} = \frac{\text{G}}{\text{N}}$$

- 100 • EPC = 1 means lack of distortions.  
101 • EPC > 1 means effective protection or incentives for producers.  
102 • EPC < 1 means negative protection in the form of taxes imposed on producers.

103

104 It should be noted that the nominal protection coefficient for both inputs and outputs is used to estimate the structure  
105 of incentives at the commodity level, while effective protection coefficient is a measure of price incentives.

106 **Local Resource Cost Ratio (DRC)<sup>(5)</sup>**: it is the ratio between benefits and costs. It is a measure of efficiency or  
107 comparative advantage of a certain commodity system. A commodity system is considered to enjoy a comparative  
108 advantage when DRC is less than or equal to the equilibrium exchange rate. It can be computed as follows:

(1) Nominal Protection Coefficient on Tradable Outputs (NPC<sub>O</sub>).  
(2) Nominal Protection Coefficient on Tradable Inputs (NPC<sub>I</sub>).  
(3) Effective Protection Coefficient (EPC).  
(4) Value added = Revenue – Inputs excluding domestic factors  
(5) Domestic Resource Costs (DRC).

$$\text{DRC} = \frac{\text{L}}{\text{N}}$$

109 • DRC <1 means that using less than one unit of domestic resources yields one unit of hard currency, indicating that  
110 the country enjoys a comparative advantage.

111 • DRC > 1 means that more than one unit of domestic resources is used to acquire one unit of hard currency,  
112 indicating that country has no comparative advantage in the global market. Alternatively, the opportunity cost of  
113 using domestic resources exceeds the value added estimated at world prices, indicating that the economic activity  
114 is unprofitable.

## 115 2.2 Sources of Data

116 The research relied on published and unpublished secondary data from various sources, including: the Ministry of  
117 Agriculture and Land Reclamation, the Central Agency for Public Mobilization and Statistics (CAPMAS), the  
118 National Planning Institute, websites of Food and Agriculture Organization of the United Nations, the United Nations  
119 and the World Bank, in addition to other websites specialized in publishing data statistics. The research also used  
120 some references and researches relevant to the study subject.

## 121 3. RESULTS AND DISCUSSION

### 122 Input Cost Analysis using Domestic and Border Prices

123 Financial analysis of average production cost per acre has been computed using domestic farmgate prices and border  
124 prices over the period 2000-2017. Findings reveal the following:

### 125 3.1 Domestic Resource Cost

#### 126 3.1.1 Labor Wages

127 Figures in Table (2) indicate that wages of labor hired for wheat, maize, rice and potatoes production in market prices  
128 is higher than wages computed in border prices. Average value of labor wages in financial prices reached 108.6,  
129 140.89, 126.97, 173.92 US\$ while that computed in economic prices reached 81.75, 105.67, 95.23, 130.44 US\$.

130 **Table 2: Production Cost Items Assessed in Financial and Economic Prices of main crops Grown in**  
131 **Egypt over the period 2000-2017**

		Wheat		Maize		Rice		Potatoes	
		Financial Prices	Economic prices*	Financial Prices	Economic prices*	Financial Prices	Economic prices*	Financial Prices	Economic prices*
Total cost of domestic	Labor Wages	108.6	81.75	140.89	105.67	126.97	95.23	173.92	130.44
	Wages of Draft Animals	3.7	3.7	1.01	1.01	5.83	5.83	5.94	5.94
	Wages of Machinery	75.4	84.45	56.64	63.44	93.81	105.07	68.05	76.22
	General Expenses	28.4	28.4	28.66	28.66	31.02	31.02	93.92	93.92
	Rent	213.5	189.11	175.89	240.41	240.41	157.89	148.46	240.41
	Total cost of domestic resource	429.6	387.41	403.09	438.52	498.04	395.04	490.29	<b>546.93</b>
Total production	Seeds Cost	26.9	30.13	28.66	32.09	26.18	29.32	576.41	645.58
	Manure	11.6	11.6	24.01	24.01	4.6	4.6	46.69	46.69
	Fertilizers	51.2	74.24	60.81	88.17	45.51	65.99	127.59	185.00
	Insecticides	11.3	12.32	8.02	8.74	17.61	19.19	44.67	48.69
	Total production inputs	129.44	156.69	150.16	181.67	124.92	150.12	889.28	1020
		Total costs	230.44	284.98	271.66	334.68	218.82	269.22	1684.62

132 Source: Author Calculation, 2019.

133  
134 \* Economic value has been computed using conversion factors estimated by experts from the World Bank in 2000, as follows: 1.12  
135 for seeds; 1.45 for chemical fertilizers; 1.09 for pesticides; 0.75 for human labor; 1.12 for machinery. Other items remained  
136 unchanged. As for land, opportunity cost is the revenue producer can get from his land without bearing the burdens of risks in  
137 agricultural production, which is usually the economic rent (leasing to others for one year) assessed on the basis of duration of crop  
138 stay in land (world bank, 2000).

### 139 3.1.2 Cost of Machinery

140 Figures in Table (2) indicate that cost of machinery rented for wheat, maize, rice and potatoes production in market  
141 prices is less than that computed in border prices. Average rent in financial prices reached 75.4, 56.64, 93.81, 68.05  
142 US\$, while that computed in economic prices reached 84.45, 63.44, 105.07, 76.22 US\$.

### 143 3.1.3 Cost of Production Inputs

144 Figures in Table (2) indicate that average cost of production inputs in financial prices (including fertilizers, pesticides  
145 and seeds) reached 89.4, 97.49, 89.3, 748.67 US\$, while that computed in economic prices reached 116.69, 129,  
146 114.5, 879.27 US\$.

### 147 3.2 Impact of Agricultural Price Policy on wheat Crop:

148 It is ~~evident~~ clear from Table (3), which illustrates the results of PAM applied to wheat grown in Egypt over the  
149 period (2000-2017), that average revenue reached US\$ 735.43 in financial prices, while reached US\$ 925.55 in  
150 economic prices, resulting in a policy impact of US\$ 190.12, indicating that wheat producers incurred implicit taxes  
151 estimated at US\$ 190.12 as average of the study period.

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156 **Table 3: Policy Analysis Matrix for wheat Grown in Egypt over the Period 2000-2017**

157

	Total revenue	Total production input	Total cost of domestic			Net Revenue	Added Value
			Total labor	Total rent (land)	Total		
Financial prices	735.43	129.42	187.65	213.48	401.13	204.9	606.01
Economic prices	925.55	152.69	168.42	189.11	357.53	415.33	772.86
Policy impact	(190.12)	(23.27)	19.23	24.37	43.6	(210.43)	(166.85)

158 Numbers between the brackets are Negative

159 Source: Author Calculation, 2019.

160  
161 Results also show that wheat farmers bear costs of production inputs during the study period (2000-2017), estimated  
162 at US\$ 129.42 in financial prices, corresponding to US\$ 152.69 in economic prices, resulting in a policy impact of  
163 US\$ 23.27, which means that cost of production inputs declined by US\$ 23.27 during the study period.

164 In addition, wheat farmers incurred implicit taxes on hired labor (as domestic resource) estimated at US\$ 19.23 as  
165 average of the study period. As for net revenue, which reflects implicit taxes incurred by producers and subsidy  
166 received, it can be noted from Table (3) that it amounted to US\$ 204.9 in financial prices and US\$ 415.33 in economic  
167 prices, resulting in a policy impact of US\$ 210.43, indicating that wheat producers incurred implicit taxes amounting  
168 to US\$ 210.43 as average of the study period.

Comment [AM12]: What are the implications of this?

Comment [AM13]: Ditto.

169 **3.2.1 Nominal Protection Coefficient on Outputs (NPC<sub>o</sub>)**

170 As shown in Table (4), Nominal Protection Coefficient on Outputs amounted to 0.79, which is less than unity,  
171 indicating absence of fair production policy over the study period 2000-2017. In other words, domestic prices of  
172 wheat is lower than international prices, resulting in wheat producers incurring implicit taxes amounting to 21% due  
173 to receiving only 79% of the real price they should get for their product. Such result means that the implemented  
174 policy was not in favor of domestic wheat producers.

175 **Table 4: Nominal Protection Coefficient, Effective Protection Coefficient and Domestic Resource Cost Ratio for**  
176 **Wheat Grown in Egypt over the Period 2000-2017**

Items	Value
NPC <sub>o</sub>	0.79
NPC <sub>i</sub>	0.85
EPC	0.78
DRC	0.46

178  
179 Source: Calculated from table 2.

181 **3.2.2 Nominal Protection Coefficient on Inputs (NPC<sub>i</sub>)**

182 Results in Table (4) show that Nominal Protection Coefficient on Inputs amounted to 0.85, which is less than unity,  
183 indicating very low subsidy on inputs used in wheat production over the study period 2000-2017. In other words,  
184 wheat producers received a subsidy as low as 15% on production inputs. This also means that subsidy to wheat  
185 producers is diminishing, which complies with the implemented agricultural policy of gradual removal of subsidy on  
186 production inputs until reaching price levels proportionate to their economic cost thus international prices. Such  
187 finding indicates that the implemented economic liberalization policy resulted in very limited subsidy on production  
188 inputs for wheat producers.

189  
190 **3.2.3 Effective Protection Coefficient (EPC)**

191 It is ~~evident~~ from Table 4 that Effective Protection Coefficient amounted to 0.78, which is less than unity,  
192 indicating that wheat producers incur implicit taxes. In other words, value added in domestic prices is lower than that  
193 in international prices, which means absence of protection policy during the study period. Such result means that the  
194 government has been imposing taxes, either direct or indirect, or it has been subsidizing wheat imports.

195 **3.2.4 Domestic Resources Cost Ratio DRC (Comparative Advantage)**

196 Results in Table 4 show that Domestic resource Cost Ratio amounted to 0.46, indicating that Egypt enjoyed a  
197 comparative advantage in wheat production during the study period 2000-2017, which means that domestic  
198 production of wheat is preferred to dependency on imports.

199 **3.3 Impact of Agricultural Price Policy on maize Crop:**

200 It is also clear from Table (5), which illustrates the results of PAM applied to maize grown in Egypt over the period  
201 (2000-2017), that average revenue reached US\$ 799.63 in financial prices, while reached US\$ 1006.34 in economic  
202 prices, resulting in a policy impact of US\$ 206.71, indicating that maize producers incurred implicit taxes estimated at  
203 US\$ 206.71 as average of the study period.

204 **Table 5: Policy Analysis Matrix for maize Grown in Egypt over the Period 2000-2017**

205

	Total revenue	Total production input	Total cost of domestic			Net Revenue	Added Value
			Total labor	Total rent (land)	Total		
<b>Financial prices</b>	799.63	150.15	198.54	175.89	374.43	275.05	649.48
<b>Economic prices</b>	1006.34	178.26	170.76	240.41	411.17	416.91	828.08
<b>Policy impact</b>	(206.71)	(28.11)	27.78	(64.52)	(36.74)	(141.86)	(178.6)

Numbers between the brackets are Negative

Source: Author Calculation, 2019.

Results also show that maize farmers bear costs of production inputs during the study period (2000-2017), estimated at US\$ 150.15 in financial prices, corresponding to US\$ 178.26 in economic prices, resulting in a policy impact of US\$ 28.11, which means that cost of production inputs declined by US\$ 28.11 during the study period.

In addition, maize farmers incurred implicit taxes on hired labor (as domestic resource) estimated at US\$ 27.78 as average of the study period. As for net revenue, which reflects implicit taxes incurred by producers and subsidy received, it can be noted from Table (5) that it amounted to US\$ 275.05 in financial prices and US\$ 416.91 in economic prices, resulting in a policy impact of US\$ 141.86, indicating that maize producers incurred implicit taxes amounting to US\$ 141.86 as average of the study period.

### 3.3.1 Nominal Protection Coefficient on Outputs (NPC<sub>o</sub>)

As shown in Table (6), Nominal Protection Coefficient on Outputs amounted to 0.79, which is less than unity, indicating absence of fair production policy over the study period 2000-2017. In other words, domestic prices of maize is lower than international prices, resulting in maize producers incurring implicit taxes amounting to 21% due to receiving only 79% of the real price they should get for their product. Such result means that the implemented policy was not in favor of domestic maize producers.

**Table 6: Nominal Protection Coefficient, Effective Protection Coefficient and Domestic Resource Cost Ratio for maize Grown in Egypt over the Period 2000-2017**

Items	Value
<b>NPC<sub>o</sub></b>	<b>0.79</b>
<b>NPC<sub>I</sub></b>	<b>0.84</b>
<b>EPC</b>	<b>0.78</b>
<b>DRC</b>	<b>0.46</b>

Source: Calculated from table 6.

### 3.3.2 Nominal Protection Coefficient on Inputs (NPC<sub>I</sub>)

Results in Table (6) show that Nominal Protection Coefficient on Inputs amounted to 0.84, which is less than unity, indicating very low subsidy on inputs used in maize production over the study period 2000-2017. In other words, maize producers received a subsidy as low as 16% on production inputs. This also means that subsidy to maize producers is diminishing, which complies with the implemented agricultural policy of gradual removal of subsidy on production inputs until reaching price levels proportionate to their economic cost thus international prices. Such finding indicates that the implemented economic liberalization policy resulted in very limited subsidy on production inputs for maize producers.

### 3.3.3 Effective Protection Coefficient (EPC)

238 It is clear from Table 6 that Effective Protection Coefficient amounted to 0.78, which is less than unity, indicating that  
 239 maize producers incur implicit taxes. In other words, value added in domestic prices is lower than that in international  
 240 prices, which means absence of protection policy during the study period. Such result means that the government has  
 241 been imposing taxes, either direct or indirect, or it has been subsidizing maize imports.

### 242 3.3.4 Domestic Resources Cost Ratio DRC (Comparative Advantage)

243 Results in Table 6 show that Domestic resource Cost Ratio amounted to 0.50, indicating that Egypt enjoyed a  
 244 comparative advantage in maize production during the study period 2000-2017, which means that domestic  
 245 production of maize is preferred to dependency on imports.

### 246 3.4 Impact of Agricultural Price Policy on Rice Crop:

247 It is also clear from Table (7), which illustrates the results of PAM applied to rice grown in Egypt over the period  
 248 (2000-2017), that average revenue reached US\$ 950.99 in financial prices, while reached US\$ 1169.89 in economic  
 249 prices, resulting in a policy impact of US\$ 218.9, indicating that rice producers incurred implicit taxes estimated at  
 250 US\$ 218.9 as average of the study period.

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**Table 7: Policy Analysis Matrix for Rice Grown in Egypt over the Period 2000-2017**

	Total revenue	Total production input	Total cost of domestic			Net Revenue	Added Value
			Total labor	Total rent (land)	Total		
<b>Financial prices</b>	950.99	124.92	226.61	240.41	467.02	359.05	826.07
<b>Economic prices</b>	1169.89	146.86	205.71	175.89	381.6	641.43	1023.03
<b>Policy impact</b>	(218.9)	(21.94)	20.9	64.52	85.42	(282.38)	(196.96)

256 Numbers between the brackets are Negative

257 Source: Author Calculation, 2019.

258 Results also show that rice farmers bear costs of production inputs during the study period (2000-2017), estimated at  
 259 US\$ 124.92 in financial prices, corresponding to US\$ 146.86 in economic prices, resulting in a policy impact of US\$  
 260 21.94, which means that cost of production inputs declined by US\$ 28.11 during the study period.

261 In addition, rice farmers incurred implicit taxes on hired labor (as domestic resource) estimated at US\$ 20.9 as  
 262 average of the study period. As for net revenue, which reflects implicit taxes incurred by producers and subsidy  
 263 received, it can be noted from Table (7) that it amounted to US\$ 359.05 in financial prices and US\$ 641.43 in  
 264 economic prices, resulting in a policy impact of US\$ 282.38, indicating that rice producers incurred implicit taxes  
 265 amounting to US\$ 282.38 as average of the study period.

### 266 3.4.1 Nominal Protection Coefficient on Outputs (NPC<sub>o</sub>)

267 As shown in Table (8), Nominal Protection Coefficient on Outputs amounted to 0.81, which is less than unity,  
 268 indicating absence of fair production policy over the study period 2000-2017. In other words, domestic prices of rice  
 269 is lower than international prices, resulting in rice producers incurring implicit taxes amounting to 19% due to  
 270 receiving only 81% of the real price they should get for their product. Such result means that the implemented policy  
 271 was not in favor of domestic rice producers.



272 **Table 8: Nominal Protection Coefficient, Effective Protection Coefficient and Domestic Resource**  
 273 **Cost Ratio for Rice Grown in Egypt over the Period 2000-2017**  
 274

Items	Value
NPC <sub>0</sub>	0.81
NPC <sub>1</sub>	0.85
EPC	0.81
DRC	0.37

275  
 276 Source: Calculated from table 6.  
 277

278  
 279 **3.4.2 Nominal Protection Coefficient on Inputs (NPC<sub>1</sub>)**

280 Results in Table (8) show that Nominal Protection Coefficient on Inputs amounted to 0.85, which is less than unity,  
 281 indicating very low subsidy on inputs used in rice production over the study period 2000-2017. In other words, rice  
 282 producers received a subsidy as low as 15% on production inputs. This also means that subsidy to rice producers is  
 283 diminishing, which complies with the implemented agricultural policy of gradual removal of subsidy on production  
 284 inputs until reaching price levels proportionate to their economic cost thus international prices. Such finding indicates  
 285 that the implemented economic liberalization policy resulted in very limited subsidy on production inputs for rice  
 286 producers.

287 **3.4.3 Effective Protection Coefficient (EPC)**

288 It is clear from Table 8 that Effective Protection Coefficient amounted to 0.81, which is less than unity, indicating that  
 289 rice producers incur implicit taxes. In other words, value added in domestic prices is lower than that in international  
 290 prices, which means absence of protection policy during the study period. Such result means that the government has  
 291 been imposing taxes, either direct or indirect.

292 **3.4.4 Domestic Resources Cost Ratio DRC (Comparative Advantage)**

293 Results in Table 8 show that Domestic resource Cost Ratio amounted to 0.37, indicating that Egypt enjoyed a  
 294 comparative advantage in rice production during the study period 2000-2017, which means that domestic production  
 295 of rice is preferred to dependency on imports.

296 **3.5 Impact of Agricultural Price Policy on Potatoes Crop:**

297 It is also clear from Table (9), which illustrates the results of PAM applied to Potatoes grown in Egypt over the period  
 298 (2000-2017), that average revenue reached US\$ 1986.60 in financial prices, while reached US\$ 2389.51 in economic  
 299 prices, resulting in a policy impact of US\$ 402.91, indicating that Potatoes producers incurred implicit taxes estimated  
 300 at US\$ 402.91 as average of the study period.

301 **Table 9: Policy Analysis Matrix for Potatoes Grown in Egypt over the Period 2000-2017**  
 302

	Total revenue	Total production input	Total cost of domestic			Net Revenue	Added Value
			Total labor	Total rent (land)	Total		
<b>Financial prices</b>	1986.60	889.26	247.92	184.46	432.38	664.96	1097.34
<b>Economic prices</b>	2389.51	1058.2	222.54	240.41	462.95	868.36	1331.31
<b>Policy impact</b>	(402.91)	(168.94)	25.385	(55.95)	(30.57)	(203.4)	(233.97)

303 Numbers between the brackets are Negative  
 304 Source: Author Calculation, 2019.

305 Results also show that Potatoes farmers bear costs of production inputs during the study period (2000-2017),  
306 estimated at US\$ 889.26 in financial prices, corresponding to US\$ 1058.2 in economic prices, resulting in a policy  
307 impact of US\$ 168.94, which means that cost of production inputs declined by US\$ 168.94 during the study period.

308 In addition, Potatoes farmers incurred implicit taxes on hired labor (as domestic resource) estimated at US\$ 25.385 as  
309 average of the study period. As for net revenue, which reflects implicit taxes incurred by producers and subsidy  
310 received, it can be noted from Table (9) that it amounted to US\$ 664.96 in financial prices and US\$ 868.36 in  
311 economic prices, resulting in a policy impact of US\$ 203.4, indicating that Potatoes producers incurred implicit taxes  
312 amounting to US\$ 203.4 as average of the study period.

### 313 **3.5.1 Nominal Protection Coefficient on Outputs (NPC<sub>o</sub>)**

314 As shown in Table (10), Nominal Protection Coefficient on Outputs amounted to 0.83, which is less than unity,  
315 indicating absence of fair production policy over the study period 2000-2017. In other words, domestic prices of  
316 Potatoes is lower than international prices, resulting in Potatoes producers incurring implicit taxes amounting to 17%  
317 due to receiving only 83% of the real price they should get for their product. Such result means that the implemented  
318 policy was not in favor of domestic Potatoes producers.

319 **Table 10: Nominal Protection Coefficient, Effective Protection Coefficient and Domestic Resource**  
320 **Cost Ratio for Potatoes Grown in Egypt over the Period 2000-2017**

Items	Value
NPC <sub>o</sub>	0.81
NPC <sub>i</sub>	0.85
EPC	0.81
DRC	0.37

322  
323 Source: Calculated from table 8.  
324

### 325 **3.5.2 Nominal Protection Coefficient on Inputs (NPC<sub>i</sub>)**

326 Results in Table (11) show that Nominal Protection Coefficient on Inputs amounted to 0.84, which is less than unity,  
327 indicating very low subsidy on inputs used in Potatoes production over the study period 2000-2017. In other words,  
328 Potatoes producers received a subsidy as low as 16% on production inputs. This also means that subsidy to Potatoes  
329 producers is diminishing, which complies with the implemented agricultural policy of gradual removal of subsidy on  
330 production inputs until reaching price levels proportionate to their economic cost thus international prices. Such  
331 finding indicates that the implemented economic liberalization policy resulted in very limited subsidy on production  
332 inputs for Potatoes producers.

### 333 **3.5.3 Effective Protection Coefficient (EPC)**

334 It is clear from Table 10 that Effective Protection Coefficient amounted to 0.82, which is less than unity, indicating  
335 that Potatoes producers incur implicit taxes. In other words, value added in domestic prices is lower than that in  
336 international prices, which means absence of protection policy during the study period. Such result means that the  
337 government has been imposing taxes, either direct or indirect.

### 338 **3.5.4 Domestic Resources Cost Ratio DRC (Comparative Advantage)**

339 Results in Table 10 show that Domestic resource Cost Ratio amounted to 0.35, indicating that Egypt enjoyed a  
340 comparative advantage in Potatoes production during the study period 2000-2017, which means that domestic  
341 production of Potatoes is preferred to dependency on imports.

342 **4. Conclusion and recommendations:**

343 Wheat, maize, rice and potatoes are major crops in Egypt, domestic wheat production declined from 9.34 million tons  
344 in 2016 to 8.42 million tons in 2017, down by 9.9%. In 2017, average per capita share of wheat amounted to 163.9  
345 kg/year and self-sufficiency rate amounted to 34.5%. While Maize production increased from 7.17 million tons in  
346 2016 to 7.66 million tons in 2017, average per capita share of maize amounted to 52.2 kg/year and self-sufficiency  
347 rate amounted to 46.10%. Rice production also declined from 5.31 million tons in 2016 to 4.96 million tons in 2016,  
348 down by 10.2%. In 2017, average per capita share of rice amounted to 38.7 kg/year and self-sufficiency rate amounted  
349 to 87.96%. Potatoes production also declined from 5.02 million tons in 2016 to 4.84 million tons in 2017, average per  
350 capita share of potatoes amounted to 25.4 kg/year and self-sufficiency rate amounted to 116.28%. The current research  
351 investigates the problems arising from impact of agricultural price policy in agricultural production through adopting  
352 development strategies that aim to achieve free market economy and dependency on interaction between supply and  
353 demand forces as main pillar to raise efficiency of the national economy and achieve the hoped for development,  
354 which all resulted in producers bearing the burden of paying indirect taxes (implicit) due to price distortions resulting  
355 from imbalances between domestic and international prices. Such situation obstructs efforts exerted to achieve  
356 optimum economic efficiency in domestic resources' use as well as the welfare of producers and consumers.

357 The research applied Policy analysis matrix to determine indicators that can be help to identify trends of agricultural  
358 policies implemented in the agricultural sector and measure the efficiency of economic resources' use. PAM is usually  
359 built using farm budget, including revenues and costs, which occur in the form of tradable inputs (production inputs)  
360 and domestic resources (land and labor). In PAM, both revenues and costs are evaluated financially (at market prices)  
361 and economically (at border prices) to assess the impact of the implemented policy by measuring Nominal Protection  
362 Coefficient for outputs and inputs, Effective Protection Coefficient and Comparative Advantage Coefficient  
363 (Domestic Resource Cost Coefficient).

364 The results showed that the financial value of workers' wages in the production of wheat, maize, rice, and potatoes at  
365 market prices exceeded the border prices, while the values of the nominal protection coefficients of outputs were  
366 about 0.81, 0.81, 0.80, 0.83 for wheat, maize, rice, and potatoes. Nominal protection coefficient values for production  
367 inputs were 0.83, 0.83, 0.85, and 0.84 respectively for the four crops, while the effective protection plant values for  
368 wheat, maize, rice, and potato crops were 0.80, 0.80, 0.80 and 0.84, respectively. The values of the comparative  
369 advantage of the four crops, respectively, were 0.49, 0.52, 0.38, and 0.37.

370 **Based on the research results, we recommend the following:**

- 371 I. Expansion of wheat and maize crops to reduce the quantity imported.
- 372 II. Revisiting governmental policies and devoting more attention to increasing wheat, maize, rice and potatoes  
373 planted areas in main producing governorates based on production efficiency indicators, and taking into  
374 account wheat, maize, rice and potatoes profitability relative to the profitability of competing crops.
- 375 III. Vertical expansion in wheat, maize, rice and potatoes production via developing new high yielding varieties  
376 to boost wheat, maize, rice and potatoes production.

**Comment [AM14]:** The conclusions should be aligned to the objectives of the research as well the findings BUT this is not the case in this study. This is one area that has to be strongly tightened up.

**Comment [AM15]:** All recommendations should speak to the findings and conclusions of the study.

- 377 IV. Providing support to wheat, maize, rice and potatoes farmers in the form of good varieties of seed, fertilizers  
378 and other production inputs to encourage farmers cultivate the crop.
- 379 V. Setting a procurement price, close to the international prices of wheat, maize, rice and potatoes, three months  
380 prior to wheat, maize, rice and potatoes planting season, such that the announced price is fair to producers,  
381 i.e., it covers production cost and provide a fair profit margin, and in the same time is a fair price for  
382 consumers.  
383

## 384 REFERENCES

- 385 1. EL-Batran, Ramzia., Mohamed, Abd El-Wahab. Evaluation of some Agricultural Policies Applied in Egypt  
386 during the 1980s and 1990s; MSc. Thesis(unpublished), Department of Agricultural Economics, Faculty of  
387 Agriculture, Cairo University, 2002 pp. 227- 239.
- 389 2. Owen, R., and Ş. Pamuk. A History of Middle East Economies in the Twentieth Century. Cambridge,  
390 Massachusetts: 1998; Harvard university Press.
- 391 3. El-Qalla, Hasan., Ramzy, Agricultural Exports' Role in Agricultural Economics Development in Egypt".  
392 Egyptian Journal of Agricultural Economics, 2002; 12 (1): 340-355.
- 393 4. CAPMAS. Foreign Trade Database, Foreign Trade Bulletins, Govt. Egypt., Cairo. 2017.
- 394 5. MALR. Economic Affairs Sector, Central Administration for Agricultural Economics, Bulletin of  
395 Agricultural Economics. 2017.
- 396 | 6. Ahmed, Moataz. E. An Economic Study of Egyptian Exports of Potatoes crop. M.Sc. Thesis  
397 (unpublished). 2016; Department. Of Agri. Economics., Univ. Agri., Minia.
- 398 | 7. The Central Agency for Public Mobilization and Statistics. (CAPMAS), Annual Bulletin of Agricultural  
399 Commodities' Production, Foreign Trade and Consumption Statistics 2017.
- 400 | 8. Ahmed, H. An Economic study to evaluate the impact of the direct and indirect government intervention  
401 on wheat crop in Egypt. Egyptian J. of Agri. Eco. 2015; 25(4): 1963-1974.
- 402 | 9. Said, M, A. The effect of the agriculture pricing policies on the Maize crop in Egypt. J. Agric. Economic.  
403 and Social Sci., Mansoura Univ. (2013); 12 (4): 2393-2404.
- 404 | 10. EL-Sayed, A. Impacts of the agricultural price policy on onion crop in Egypt. Alex. J. of Environmental  
405 and Agri. Sci. (2007);6(2): 1-23.
- 406 | 11. Kamel, A. and Saleh, A. Analyzing of the agricultural policies on the economic indicators of the  
407 cropping patterns in Egypt. Egyptian J. of Agri. Eco. (2015) ;25(4): 1891-1904.
- 408 | 12. Moataz Eliw Mostafa, Abd El-Wakil M. Abou-Taleb and Umar Ijaz Ahmed. Impact of Governmental  
409 Intervention on Wheat Crop Grown in Egypt, Journal of Social Sciences and Humanity Studies, (2019);  
410 5(5)1-17.

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**Comment [AM16]:** Where does this list of references comes from because these references were not cited in the text?