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# The Development of the Value of Agricultural Production – A Case Study of Yemen

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## ABSTRACT

*The agricultural sector is one of the most important productive sectors in the Yemen economy. It is one of the main sectors that increasing the size of GDP. The present study investigated the development of the value of agricultural production. The data has been analyzed by using SPSS- 25 software with different tests such as Time series test, correlation, and OLS regression. The results revealed that the value of agricultural production has taken an increasing general trend, with an increase of 510 % compared to the year 2000. The agricultural production value is very modest, where the value of agricultural production is around 18.9 % of the average period of the gross domestic product value (GDP). The data shown that Qat on the first rank about 24% of the agricultural production of the average period of study (2000-2013), whereas the wool about 0.2% in the last ranked.*

**Keywords:** agricultural production, GDP, agricultural crops, animal production, fish production.

## INTRODUCTION

The Republic of Yemen is located in the south-western region of the Arabian Peninsula in the west of the Asian continent, between Oman and Saudi Arabia, where it bounded from the north of Saudi Arabia. While Oman bordered on the eastern side, and bordered the Arabian Sea on the southern part, while the Red Sea western side is bordered. Yemen situated at the entrance to the Bab-el-Mandeb Strait, which links the Red Sea to the Indian Ocean (via the Gulf of Aden), it is one of the most active and strategic shipping lanes in the world. Yemen's land boundaries total 1,746 kilometers (1,085 mi). Yemen borders Saudi Arabia to the north (1,458 km or 906 mi) and Oman to the northeast (288 km or 179 mi).<sup>1</sup> Yemen is a country geographically diverse of mountains, plains, and deserts. It covering around 203,849 square miles (527,970 square kilometers) including 112 islands, Yemen covered with desert, coastal plains and many highlands, which receive benefits from the rainfalls.<sup>2</sup> The Population of Yemen was about 26,687,000 million, is divided into 21 cities, 333 districts, and 1,996 sub-districts. It has 40,793 villages and 88,817 sub villages <sup>3</sup> Economy of Yemen is based on Agriculture and the country is known in the entire region for its high Agricultural potential<sup>4</sup>. The agricultural sector is one of the most important productive sectors in the Yemeni economy. The main sectors that increase the size of GDP, In addition to being the productive sector for food commodities, its allocations from donor countries in the third five-year development plan of economic and social services about 229.3 million US dollars that means 84.6% of the total allocation of productive sectors<sup>5</sup>. In Yemen, the majority of the population depends on the agricultural sector for their survival. The agricultural sector contains about 2 million workers who represent about 53% of the total workforce<sup>6</sup>, which helps in creating employment and alleviating poverty, especially in rural areas. This sector also constitutes an essential point for integrated rural development and reduction of internal migration.

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Agriculture is the main source of income for 73.5% of the population of Yemen whether directly or indirectly such as services, crafts and industries which serving the rural and urban population<sup>7</sup>. However, the agricultural sector does not have priorities in economic and social development strategies. In this sector, laborers are very modest in their material property and their inability to save.

## **MATERIAL AND METHOD**

To study the growth value of the agricultural productions in Yemen, from annual time series data spanning the period between 2000 and 2013, the data of value of Gross domestic product (GDP), agricultural production, agricultural crops, animal production and fish production were collected and the study of the value of agricultural production, agricultural crops, animal production and fish production were done with respect to the value of Gross domestic product (GDP). Then, the study of the value of agricultural crops, animal production and fish production were done with respect to the value of agricultural production. In the present study, the statistical analysis used by the software SPSS-25 and time series test, OLS regression, correlation, F test, means, and percentages.

## **RESULT AND DISCUSSION**

### **The value of plant production**

The data presented in Table (1) shows that the value of plant production is around 13 % of the average period of the gross domestic product value (GDP). The highest value in the year of 2013 about 5733 million dollars equivalent to 26.9 % of GDP. The lowest value in the year of 2000 about 1188 million dollars of plant production equivalent to 10.9 % of GDP. While the plant production represents nearly 70 % of the value of agricultural production, the average period is almost 61.2% of the value of agricultural production in the year 2013 and around 77.3 % in the year 2000. It is noticeable that these values do not match with the size of the sector, where this sector is a main source of livelihood more than 75% of the population, perhaps the most important reasons for this decline related to the difficulties and natural constraints, technical and economic problems which suffer from the internal structure of the limited arable land, the fragmentation of agricultural holdings and the lack of water resources, and the impact of the productivity of the sector in the rain, where rainforest agriculture represented about 72% of the cultivated areas<sup>8</sup>.

### **The value of animal production**

The data in Table (1) shows that the value of animal production is about 4.3% respected to the average period of the GDP value. The highest value in the year of 2013 around 3125 \$ million, equivalent to 9% of the GDP value, and the lowest value in the year of 2000, where the value of animal production about 246\$ million, equivalent to 2.3% of the GDP value. While animal production represents about 23.4% of the value of agricultural production during the average period (2000-2013), 16% of the value of agricultural production in 2000 and about 33% in 2013.

### **The value of fish production**

The data in Table (1) shows that the value of fish production represents about 6.6% of the value of GDP during the average period (2000-2013). The highest value in 2011 about 544 \$ million, equivalent to 1.8% of GDP and about 6.9% of the value of agricultural production. The lowest value in the year 2000, about 102 million dollars equivalent to 0.9% of the GDP and about 6.6% of the value of agricultural production.

The significant decline in the growth rate of this sector is due to many reasons such as the fact that this sector has not been received with sufficient attention to exploiting its potential as a natural resource which that can't be depleted in case of good investment. Another reason, recently this sector has exposure to piracy.

**Table (1) Value of agricultural production and its relative importance during the period (2000 to 2013)**

Value in (000,000 \$)

No	Statement	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	Average
1	Value of GDP	10,864	11,249	12,225	13,555	15,616	19,050	22,812	25,634	30,395	28,459	30907	31079	32075	34714	318,634	22760
2	Agricultural production value	1,536	1,827	1,911	2,201	2,508	3,077	3,543	4,280	4,832	5,908	6,042	7814	8536	9371	63,386	4528
3	% of GDP	14.1	16.3	15.6	16.2	16.1	16.1	15.5	16.7	15.9	21.0	20.9	25.1	26.6	26.9	263	18.9
4	Plant production value	1,188	1,406	1,424	1,540	1,771	2,110	2,486	3,035	3,526	4,127	4,180	5078	5376	5733	42,980	3070
5	% of GDP	10.9	12.5	11.7	11.4	11.4	11.1	10.9	11.8	11.6	14.7	14.4	16.3	16.8	16.5	182	13
6	% Value of agricultural production	77.3	77	74.5	70	70.6	68.6	70.2	70.9	73	69.9	69.2	64.9	62.9	61.2	980	70
7	Animal production value	246	279	299	451	496	700	792	996	1,199	1,582	1,693	2192	2617	3125	16,667	1191
8	% of GDP	2.3	2.5	2.4	3.3	3.2	3.7	3.5	3.9	3.9	5.6	5.8	3.2	8.2	9	61	4.3
9	% Value of agricultural production	16	15.3	15.6	20.5	19.8	22.7	22.4	23.3	24.8	26.8	28	28.1	30.7	33.3	327	23.4
10	Fish production value	102	142	188	210	241	267	265	249	107	199	169	544.4	543.1	512.9	3,739	267
11	% of GDP	0.9	1.3	1.5	1.5	1.5	1.4	1.2	1.0	0.4	0.7	0.6	1.8	1.7	1.5	17	1.2
12	% Value of agricultural production	6.6	7.8	9.8	9.5	9.6	8.7	7.5	5.8	2.2	3.4	2.8	6.9	6.4	5.5	93	6.6

Source:

The Central Statistical Organization, Republic of Yemen, Ministry of Planning, and International Cooperation, Annual Statistical book (2000-2013)

The general time trend equations are shown in Table (2) and by equations No (2,4,7,10) showing the growth of the value of agricultural production, the value of plant production, the value of animal production and the value of fish production in GDP. The value of agricultural production, the value of plant production, the value of animal production and the value of fish production are 612.5, 375, 211, 26 respectively, as demonstrated by the significance of the model and the statistical significance at a significant level of 5% for each of them respectively. The linear correlation coefficient between agricultural production value and GDP value about 0.97, the value of the coefficient of determination about 0.94 that indicates 94% of the change in the value of agricultural production is due to the factors that reflect their time-variable effects, and around 6% due to the factors from the out of model. The values of (F) it shows about 205 and the growth rate about 13.5 million dollars.

From the table 2, the regression equation for agricultural production can be formulated as follows

$$Y = -65.3 + 612.5X$$

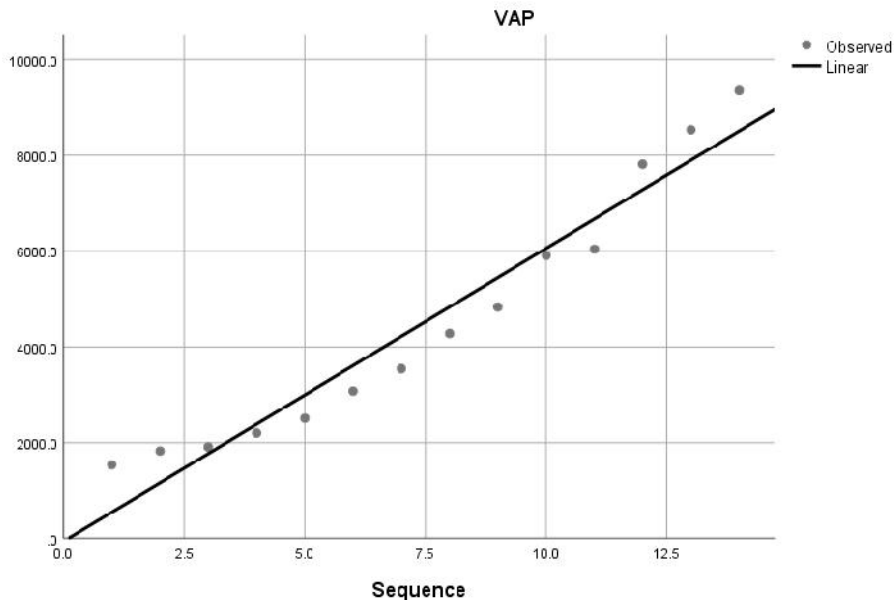
The agricultural production value can be predicted in the year 2020 as follows:

$$-65.3 + 612.5(20) = 12797.2$$

**Table (2) the time series for GDP value and agricultural production value during the period (2000 to 2013)**

Value in (000,000 \$)										
NO	Statement	R	R <sup>2</sup>	F	t	A	B	Average	growth rate	Sig
1	Value of GDP	0.98	0.95	251	15.8	7408	2047	22759.6	8.9	.000
2	Agricultural production value	0.97	0.94	205	14.3	-65.3	612.5	4527.6	13.5	.000
3	% of GDP	0.87	0.76	38	6	11.8	0.9	18.9	4.8	.000
4	Plant production value	0.98	0.96	298	17.2	256	375	3070	12.2	.000
5	% of GDP	0.83	0.68	26	5	10	0.44	13	3.4	.000
6	% Value of agricultural production	0.87	0.76	37	-6	77	-0.98	70	(-1.4)	.000
7	Animal production value	0.95	0.91	117	11	-392	211	1190.5	17.8	.000
8	% of GDP	0.83	0.68	25	5	1.2	0.4	4.3	9.3	.000
9	% Value of agricultural production	0.98	0.96	328	18	13.4	1.3	23.4	5.5	.000
10	Fish production value	0.72	0.51	13	3.6	69.8	26	267.1	9.7	.004
11	% of GDP	0.03	.001	.011	0.10	1.1	.003	1.2	0.25	.919
12	% Value of agricultural production	0.57	0.33	5.6	-2.4	9.1	-.34	6.6	(-0.45)	0.32

Calculated from the data in table No (1)



### The value of agricultural crops

From the table (3) shows the value of wheat and other grains and fruits was 93.4, 268.5 and 622.2 million dollars respectively. The value of vegetables and legumes was 426.9 and 75.6 million dollars respectively and the value of fodders and cash crops was 156.2 and 191.3 million dollars respectively, while the value of the Qat

crop was the highest value, reaching about 1104.9 million dollars during the average period of study (2000-2013). In terms of relative importance, the Qat crop ranked first in production about 37.6%, the fruits ranked second represents about 21.2% for the average period of study, then vegetable ranked third with about 14.5%, followed by fourth in other cereals by about 9.1 %, followed by the fifth in fodders by about 6.5%, then in the sixth ranked the cash crops by 5.3%, in the seventh ranked, the wheat comes by about 3.2%, and in the eighth-ranked it is the last one of legumes by about 2.6%.

We also note from the same table No. 3 that crops production represented about 64.8% of the total agricultural production.

**Table (3) Agricultural crop and its importance relative value during the period (2000 to 2013)**

**Value in (000,000 \$)**

Statement	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	Average	% Plant production	Ranking	% Agricultural production
Qat	397	514	559	614	743	940	1012	1113	1,231	1,383	1,390	1688	1828	2057	15,469	1104.9	37.6	1	24
Fruits	261	322	333	386	411	439	550	677	819	907.9	801.9	885	895	1023	8710.8	622.2	21.2	2	14
Vegetables	218	230	224	249	272	298	316	418	514	644.4	607.0	634	725	628	5977.4	426.9	14.4	3	9.4
Other cereals (maize, millet, barley, corn)	117	139	116	83	113	134	219	315	343	347.6	472.8	442	448	469	3758.4	268.5	9.1	4	6
Fodders	78	75	74	74	80	100	126	171	217	319.7	302.7	338	345	378	2678.4	191.3	6.5	5	4
Cash crops	54	54	55	72	88	111	137	158	188	245.8	258.9	255	242	268	2186.7	156.2	5.3	6	3.4
Wheat	31	36	31	30	32	47	66	103	113	165.6	153.2	152	173	175	1307.8	93.4	3.2	7	2
Legumes	34	34	32	32	34	43	59	81	102	113.3	193.9	89.9	99.4	111	1058.5	75.6	2.6	8	2
Total	1188	1406	1424	1540	1771	2110	2486	3035	3526	4127	4180	4484	4755	5109	41141	2938.6	100		64.8

Source:

The Central Statistical Organization, Republic of Yemen, Ministry of Planning, and International Cooperation, Annual Statistical book (2000-2013)

The study of equations of the general time trend of the value of agricultural crops and the data contained in Table (4) shown that the value of agricultural crops has achieved a general trend of increasing and statistical significant with the total rate increase about 375 million dollar.

From the table the significance of the model is demonstrated, and the statistical significance at a significant level of 5%.

From the table No (4), equations No (9) the value of the coefficient of determination indicates that 96 % of the change in the value of crops production is related to the factors that reflect their time-variable effects, and around 4% of the change in the value of crops production is related to the factors from the out of the model. The values of (F) it shows about 298 and the growth rate about 12.2 million dollars.

From the table No (4), the regression equation for crops production can be formulated as follows

$$Y = 256 + 375X$$

The crops production value can be predicted in the year 2020 as follows:

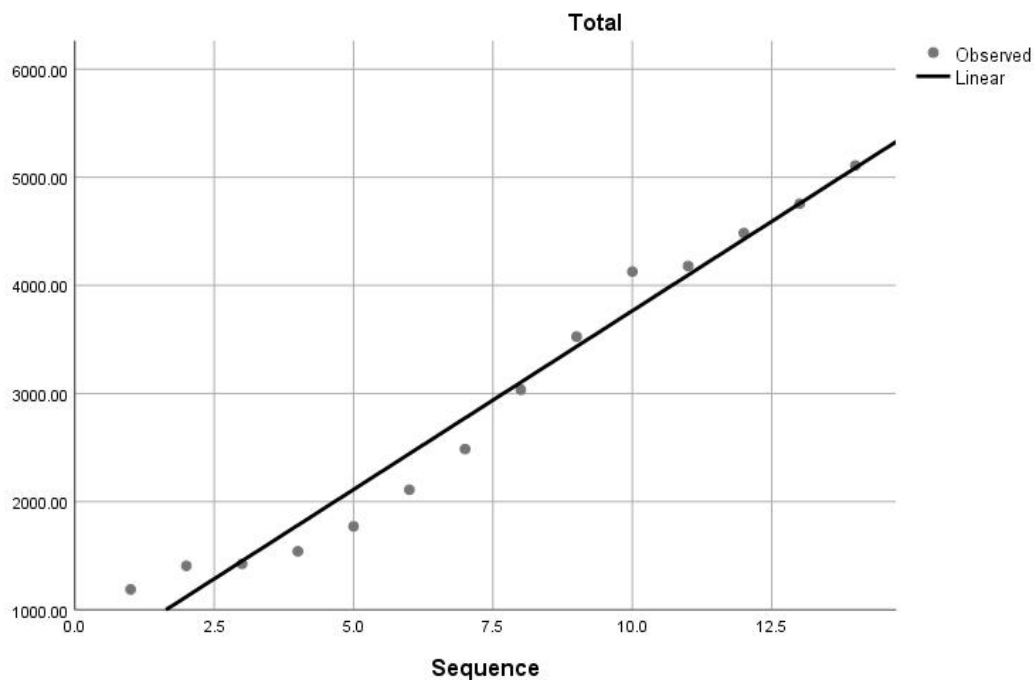
$$256 + 375(20) = 7756.$$

**Table (4) the time series of growth of value agricultural crop during the period (2000 to 2013)**

Value in (000,000 \$)

NO	Statement	R	R <sup>2</sup>	F	t	A	B	Average	growth rate	sig
1	Qat	0.99	0.98	524	22.9	185	123	15,469	795	.000
2	Fruits	0.97	0.94	198	14	163	61	8710.8	0.7	.000
3	Vegetables	0.95	0.90	109	10.4	104	43	5977.4	0.7	.000
4	Other cereals (maize, millet, barley, corn)	0.94	0.88	90	9.5	12.4	34	3758.4	0.9	.000
5	Fodders	0.95	0.90	109	10.4	-13.7	27	2678.4	1	.000
6	Cash crops	0.97	0.94	194	13.9	7.8	19.7	2186.7	0.9	.000
7	Wheat	0.95	0.90	107	10	-9.3	13.7	1307.8	1	.000
8	Legumes	0.78	0.60	18.5	4.3	10	8.7	1058.5	0.8	.001
9	Total	0.98	0.96	298	17.2	256	375	3070	12.2	.000

Calculated from the data in table No (3)



### The value of animal production

By seeing the data in table (5) it is clear that the value of red meat was about

522 \$ million, this value represents half the value of animal production for the average period (2000-2013). The value of Poultry meat, milk, and eggs was about 308, 211 and 75.5 \$ million respectively, while the value of honey, Leather (hides), wool was 38.5, 28.5 and 7.6 \$ million dollars, respectively. It is clear that red meat ranked first in animal production, representing about 45% of the average period, followed by the second-ranked meat of poultry, about 26%, then in the third-ranked milk about 17%, in the fourth-ranked egg, about 6%, in the fifth-ranked honey, about 3%, then in the sixth-ranked Leather (hides) about 2 %, finally wool in the seventh-ranked, about 1%.

From the same table No. 5 we can observe that the value of animal production about 28.2 % of the total agricultural production.

**Table (5) the value of animal production and their relative importance during the period (2000 to 2013)**

Value in (000,000 \$)

Statement	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	Average	% Animal production	Ranking	% Agricultural production
Meat	105	117	129	211	231	268	324	400	479	650	696	937	1213	1548	7308	522	45	1	12
Poultry meat	91	105	109	149	159	194	219	299	371	415	420	511	600.9	673	4315.9	308	26	2	7
Milk	28	34	38	49	49	130	135	156	192	296	365	446	486.7	549	2953.7	211	17	3	5
Eggs	21	20	19	38	54	54	61	69	83	110	80	139	149.9	159	1056.9	75.5	6	4	2
Honey	0	3	3	2	2	30	31	42	44	59	66	78.1	80.7	91.3	532.1	38	3	5	1
Leather (hides)	1	1	1	1	1	18	15	21	22	41	54	65.7	70	87	398.7	28.5	2	6	1
Wool	0	0	0	0	0	7	7	8	8	12	13	15.9	16.6	18.4	105.9	7.6	1	7	0.2
Total	246	279	299	451	496	700	792	996	1,199	1,582	1,693	2192	2617	3125	16667	1190.6	100	-	28.2

Source:

The Central Statistical Organization, Republic of Yemen, Ministry of Planning, and International Cooperation, Annual Statistical book (2000-2013)

From the equations of the general time trend of the value of animal production and the data contained in Table (6), the value of animal production has achieved a general trend of increasing and statistical significant with total rate increase of about 211 million dollars.

From equation No (8) in the table No (6), the value of the coefficient of determination also indicates that 91 % of the change in the value of animal production is due to the factors that reflect their time-variable effects, and around 9% is due to the factors from the out of the model. The values of (F) shows about 117 and the growth rate about 17.8 million dollars.

From the table, the regression equation of animal production can be formulated as follows

$$Y = -392 + 211X$$

The animal production value can be predicted in the year 2020 as follows:

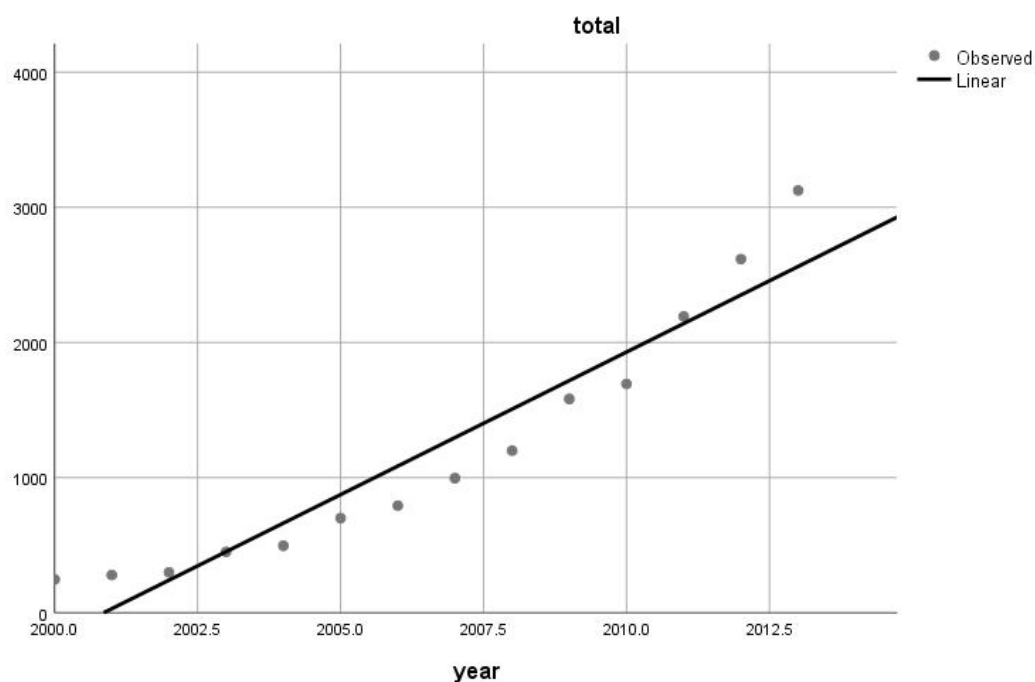
$$-392 + 211(20) = 3828$$

**Table (6) the time series for growth of value of animal products during the period (2000 to 2013)**

Value in (000,000 \$)

NO	Statement	R	R <sup>2</sup>	F	t	A	B	Average	growth rate	Sig
1	Meat, total	0.92	0.85	66.6	8.2	-1947774	97	522	18.6	.000
2	Poultry meat, total	0.97	0.95	211	14.5	-89772	44.8	75.4928	5.9	.000
3	Milk, total	0.95	0.91	122	11	-83923	41.9	210.978	19.9	.000
4	Eggs	0.96	0.92	132	11.5	-21850	10.9	38.0071	28.7	.000
5	Honey	0.98	0.95	245	15.7	-15412	7.7	28.4785	27	.000
6	Leather (hides)	0.94	0.89	94.5	9.7	-13414	6.7	7.56428	88.8	.000
7	Wool	0.97	0.94	193	13.9	-3167	1.6	1190.5	0.13	.000
8	Total	0.95	0.91	117	11	-392	211	1190.5	17.8	.000

Calculated from the data in table No (6)



### The value of fish production

The data of Table (7) is cleared that the value of the surface fish about 205.6 million dollars more than two thirds of the value of fish products during the average period, and the value of other aquatic catch, about 33.6 million dollars, while the value of deepwater fish about 27.8 million dollars.

In terms of relative importance, it is clear that the surface fish ranked first in fish production, about 77 % during the average period of the study, followed by second ranked in the Other aquatic catch by about 13% of the average value of fish production, and deepwater fish comes last ranked about 10% of the average value of fish production during the period of the study.

From the table No. 7 also we can observe that fish production around 7 % of the total agricultural production.

**Table (7) the value of fish production and their relative importance during the period (2000 to 2013)**

Value in (000,000 \$)

Statement	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	Average	% Plant production	Ranking	% Agricultural production
Surface fish	86	110	155	151	199	231	196	189	74	145	124	431.2	430.1	357.5	2878.8	205.6	77	1	5
Other aquatic catch	9	25	23	52	41	35	43	26	21	29	23	48.5	48.4	46.5	470.4	33.6	13	2	1
Deep water fish	7	6	10	6	1	1	26	34	13	25	22	64.7	64.5	108.9	389.1	27.8	10	3	1
Total	102	142	188	210	241	267	265	249	107	199	169	544.4	543.1	512.9	3739.4	267.1	100		7

Source:

The Central Statistical Organization, Republic of Yemen, Ministry of Planning, and International Cooperation, Annual Statistical book (2000-2013)



The equation of the general time trend of the value of fish production and the data contained in Table (8) shows that the value of fish production has achieved a general trend of increasing and statistical significant with total rate increase about 26 million dollars.

From the equation No (4) in the table No (8), the value of the coefficient of determination also indicates that 51 % of the change in the value of fish production is due to the factors that reflect their time-variable effects, and around 49% of the change in the value of fish production is due to factors from the out of the model. The values of (F) shows about 13 and the growth rate about 9.7 million dollars.

From the table, the regression equation for fish production can be formulated as follows

$$Y = 69.8 + 26 X$$

The fish production value can be predicted in the year 2020 as follows:

$$69.8 + 26(20) = 589.8$$

**Table (8) the time series for growth of value of fish production during the period (2000 to 2013)**

**Value in (000,000 \$)**

NO	Statement	R	R <sup>2</sup>	F	t	A	B	Average	growth rate	Sig
1	Surface fish	0.53	0.28	4.9	2.2	-274	82	205.6	39.8	.044
2	Other aquatic catch	0.48	0.23	3.8	-33.9	-33.9	12	33.6	35.7	.073
3	Deep water fish	0.64	0.40	8.7	2.9	-59	-14	27.8	-50	.011
4	Total	0.72	0.51	13	3.6	69.8	26	267.1	9.7	.004

Calculated from the data in table No (7)

## Conclusion

The value of agricultural production has taken an increasing general trend. The lowest value in the year 2000, about 1536 million dollars, and the highest value in the year 2013, about 9371 million dollars, with an increase of 510 % compared to the year 2000. However, the annual average value of agricultural production was about 4258 \$ million dollars during the period (2010-2013).

we came to know that Qat ranked first with about 24% of the agricultural production of the average period of study (2000-2013), fruits come in the second with about 14%, then in the third rank meat by about 12%, followed by vegetables ranked by about 9.4% and poultry meat in the fifth rank by about 7%, followed by sixth ranked the other cereals (maize, millet, barley, corn) by about 6% after that both milk and surface fish came in the seventh ranked by about 7%, and in the eighth-ranked fodders by about 4%, next followed by the ninth-ranked crop cash by about 3.4%, then eggs, wheat, and legumes came in the tenth rank by about 2%, then in the eleventh ranked; honey, leather, other aquatic catch, and deepwater fish by about 1% and wool in the last ranked about 0.2%.

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