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**AGRICULTURAL DEVELOPMENT SYSTEMS**  
**EGYPT PROJECT**

**UNIVERSITY OF CALIFORNIA, DAVIS**

INPUT PRICE MECHANISM IN RELATION  
TO CURRENT MARKET CONSTRAINTS

by

Riad El-Sayed Emarah, Cairo University, Egypt

Esam Abou-El-Wafa and Galal El-Malaaha

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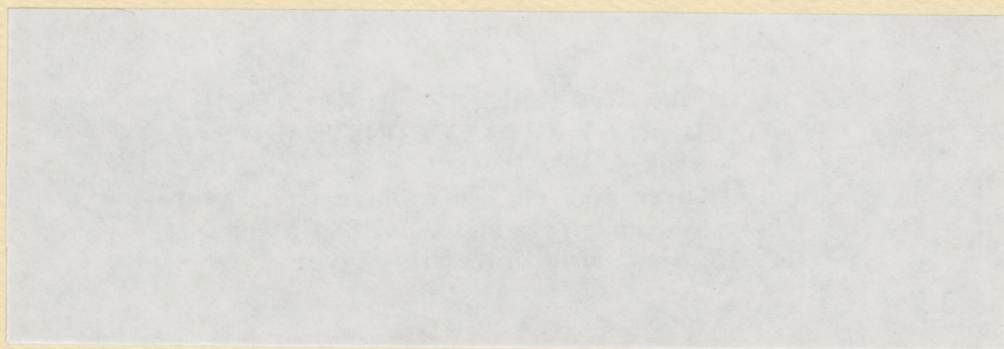
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**WORKING PAPER**

**US / EGYPT** 



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**May, 1983**

**Agricultural Development Systems:  
Egypt Project  
University of California  
Davis, Ca 95616**

## Input Price Mechanism in Relation to Current Market Constraints

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Dr. RIAD EL-SAYED EMARAH

In general, if all markets are efficient (In terms of the sufficiency of the market information ), all inputs will be allocated and used in accordance with the value of the marginal physical products .

This paper is proposed to clarify some major issues about the input prices . Given that the objective is to achieve a desired shift in the aggregate agricultural supply . It follows that there are several ways to achieve such objective . For about 15 years, the government of Egypt has tried to achieve such shift through creating excess producers' surplus " See Appendix A " . But as a result of the conflicting outcomes, this paper will examine the current input subsidy program in relation to : (1) The input gap (2) The food gap, and (3) The way of satisfying the excess effectual demands for all goods.

### Review of Literature

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There has been several studies on this subject . These studies include the net change in the surplus as a measure of welfare, the cost of the subsidy programs,

.... etc . Interested reader can follow this subjects in Abdou , Dayaa, Emarah, as many others. It is initially obvious, if the inputs are normal, then, any reduction in the input price should result in more use and hence more outputs, " See Appendix A " .

Historically, in the five-year plan '1956 - 1960' the objective was to subsidize either the final output price or the inputs for some crops . This objective had been changed in the 1960 - 1964 plan in such a way that to create more surplus to the government out of the difference in the prices of the final output . The current plan " 1982/1983 : 1986/1987 ", however, is based on subsidizing both the final output and the input prices for some crops . On the contrary , the study by Sedki, A. "1982" suggests that the price of the final output should be increased substantially . At the same time, the government should eventually eliminate the input subsidies in order to increase the output and reduce the size of imports . The same study along with Hasheash, El-Etriby and Wally's studies support the idea of rationalizing the subsidies . The Egyptian economic council's study supported Sedki's study. In general, there is an observed structural

change due to the subsidy programs, " Appendix A " . This structural change has three dimensions . They are : (1) Unbalanced changes in the costs, the value of marginal products, the wages...etc, (2) Undesired changes in the income distribution due to the unbalanced transitory changes in the prices, and (3) Over and miss-use for at least some primary , intermediate, and final goods .

#### Statistical Results

Based upon the available evidence, it is very hard to say, the sharp increase in the input subsidies after 1973 has resulted in an equivalent increase in value of the final output . This is because of (1) the rapid increase in all prices in the same period ( The consumer price Index "CPI" has tripled in the year of 1979 in comparison with the year of 1965 ), (2) the change in the exchange rate policies after 1978. During the same period, GNP in nominal and real prices has increased at annual rates about 14.05 % , and 7.57 % respectively . Further, the income originating in the agricultural sector, in nominal and real prices, has increased at annual rates about 15.58 % and 5.21 % respectively as average of 1973 - 1980 . The net increases in these real

variables are not necessarily due to the current subsidy programmes value. The nominal and real figures reveal the inputs has increased. Given the prices, this implies that the quantity has even increased. In comparison with the base period 1970 - 1972, the input subsidies " Nominal and real " have sharply increased during the period 1973 - 1979. But from Appendix the calculated **ALS** rates of growth in the productivity for major crops are, at the most around 2 %. This conclusions imply the following :

(1) After all social and economic changes in the agricultural sector, Egypt has achieved relatively low rates of growth. This justifies the idea that the government should follow other policy alternatives in order to correct the current situation.

(2) Even after subsidizing all prices, the resulting surplus has been totally consumed. Furthermore, the input gap - between actual and required - has been sharply increased in such away that Egypt is in excessive need to the world market.

Because of data limitation, this study is only concerned with fertilizer and pesticide subsidies. It reasonably for one to say that Egypt is now importing soil in

terms of fertilizers . Due to deciffficient agregate fertilizer supply, Egypt not only imports fertilizers at high prices, but also subsidies the fertilizers in the production and distribution processes Table ( 6 ) . Furthermore, the subsidies for imported fertilizers in nominal and real prices, have increased at annual rates about 12.25 % and 8.63 % respectively, Table ( 5 ) , ( 6 ) . The figures available show that the government is over subsidizing the fertilizer Table ( 6 ) . This justifies the excesses burden on the budject . Hence, one can say that the social costs have even increased . In comparison with the base period 1970 - 1972, the subsidies for domestic fertilizers , in nominal and real prices, have increased at annual rates about 43.76 % and 35.81% respectively . These high rates of growth jestifies the previous conclusions .

As for pesticides, the arrolable evidence has shown that the pesticide subsidies for cotton, rice grass, onion and soybeans have approximately doubled during the period of 1979 - 1981 Table ( 8 ) .

In summary , one can say upon the above analysis that the increase in the real GNP , GNP originaling

in the agricultural sector, and net value added in this sector are not necessarily due to the current subsidy programs . The agricultural input gap has also increased such that the policies are needed for increasing the rates of growth in the agriculture .

In order to avoid the problem of missallocation, missuse, over use ... etc , the government should follow other surplus creating policies. Further this surplus could be transfered into investment to creat more surplus .

In more than a decade Everything is almost subsidized . Egypt gained nothing other than a set of problems such as overuse and missuse of some goods, different prices for the same item, unbalanced transitory income changes for some classes ... etc. None of these serious problems will be solved if the government grantees everything for everybody . But I believe that if all market constraints are eliminated , the picture will be much better .

--ooOoo--

Table (1): Time Rates of Growth<sup>a</sup> For The Major Variables<sup>b</sup>

Variable	Rate of Growth		Variable	Rate of Growth	
	Nominal %	Real %		Nominal %	Real %
Gross national product 1965/66 - 1979	14.5	7.57	Imported fertilizers 1973 - 1979	21.25	8.63
Gross national product 1965/1966-1971/72	7.15	5.16	Domestic fertilizers 1973 - 1979	43.76	35.81
Gross national 1973 - 1974	21.04	11.74	Total subsidies 1973 -1980/1981	27.76	15.73
Cost per ton of ferti. 1977-1983	12.86 <sup>c</sup>	-	Not agricultural income 1973-1980	15.58	5.21
Production price 1977 - 1983	5.12	-	Agricultural sub- sidies 1973-1979	8.89	0.87
Subsidies per ton of Domestic ferti. 1977 -1983	20.04	-	Value of input 1973 - 1980	15.19	5.14
Farmer burden 1974 - 1979	18.53	6.92			
Government burden 1974 - 1979	7.-	-1.54			
Total Government burden in pest control 1974-1979	12.09	2.12			

<sup>a</sup>This is maximum likelihood Estimator. ( $\hat{B} Y^{-1} .100$ )

<sup>b</sup>Source: Calculated upon tables (1 -10) in the appendix B and c.

<sup>c</sup>Calculated from non-significant coefficients.

## Appendix A

The Policy alternatives of Shifting the  
Egyptian Agricultural Supply

Given that the technology could be represented by the following :

$$(Y_{ft}^{j,k}, Y_{bt}^{j,k}) = f(X_{it}^{j,k}, T) \quad (1)$$

Where:  $Y_{ft}^{j,k}$  = final outputs of jth and Kth Crops at Time t . for  $j,k = 1,2 \dots$

$Y_{bt}^{j,k}$  = by - products of j th and k th crops at time t .

$X_{it}^{j,k}$  = inputs used in producing j th and k th crops at time t. For  $i = 1,2 \dots n$

$T$  = Technology

Then : Alternative -1 Subsidizing the input price : This alternative is based on facilitating the input uses at low price per unit in comparsion with the existing market price.

In the framework of the production efficiency . Then let us assume that every farmer is a price taker ( not maker ) and he would like to maximize :

$$\begin{aligned} \Pi_t^j &= TR - TC + \lambda F ( Y_{ft}^j , Y_{bt}^j , X_{it}^j , L_t^{-j} , T ) \\ &= \sum_{k=1}^2 \sum_{j=1}^n P_{kt}^j Y_{kt}^j - \sum_{i=1}^n r_{it}^j X_{it}^j - M \\ &\quad + \lambda ( Y_{ft}^j , Y_{bt}^j , x_{it}^j , L_t^{-j} , T ) \end{aligned} \quad (2)$$

$$\text{Where : } r_{it}^j = r_{it}^j - \delta_i \quad (3)$$

TR = total revenue from all j th,

TC = total cost for all inputs,

$L_t^{-j}$  = land available for j th crop, and

$P_{kt}^j$  = price per unit per kind of output,

$r_{it}^j$  = after sub.sidy input prices,

$\delta_i$  = nominal subsidies per unit of inputs;

Then ; given that the first and second ( F.O.C, and S.O.C. are met ), the optimal input use under these constrained is :

$$X_{it}^j = x_{it}^j ( r_{it}^j , P_{ft}^j , P_{bt}^j , L_t^{-j} , T ) \quad (4)$$

This level of input uses could be compared to the free market level which is given by :

$$x_{it}^{j'} = (r_{it}^{j'}, p_{ft}^{j'}, p_{bt}^j, L_{bt}^{-j}, T) \quad (5)$$

Where ,

The resulting optimal output level could be obtained by substituting (4) and (5) respectively in Equation (1).

Alternative 2 : Price Support : Following the same procedure explained in alternative (1) , one can infer that under high output price, i.e.,

$$p_{kt}^{j'} = p_{kt}^j + \gamma_k$$

Where  $\gamma_k$  = nominal price

the level of input use is :

$$x_{it}^j = x_{it}^j (r_{it}^j, p_{kt}^{j'}, L_t^{-j}, T) \quad (7)$$

This level ; however , could be compared to the free market level which is given by Equation (5) . Further, a combination of both alternatives has been tried in the last 10 years .

The normative and positive conclusions out of the above analyses are : (1) Both alternative or any one of them - with directly ( or indirectly ) increase the total demand for the inputs, (2) the increase in the use should be reflected in high productivity growth rate <sup>(1)</sup>. But this is not the case in Egypt . This implies that the millions of pounds allowed annually for subsidies should be reconsidered again .

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(1) The percentage time rates of growth computed from Autoregressive least - Squares (ALS) for the major crops are 1.92, 1.41, 1.26, 0.091, - 0.80, 1.36 for wheat, beans, corn, rice, sugarcane, and cotton respectively .

Appendix B

Table (1): Growth National Product (G N P ) In Nominal  
And Real Values 1965/1966 - 1979 .

(Million Egyptian Pounds)

Year	Nominal Price			Real Price		
	G N P	Rate of Change	Index number	G N P	Rate of Change	Index Number
1965/1966	2388	-	100	2035.8	-	100
1966/1967	2459	2.97	103	1951.6	-4.14	96
1967/1968	2510	2.07	105	1920.4	-1.60	94
1968/1969	2657	5.86	111	2120.5	10.42	104
1969/1970	3129.5	17.78	131	2398.1	13.09	118
1970/1971	3296.8	5.35	138	2462.1	2.67	121
1971/1972	3527.1	6.99	148	2603	5.72	128
Average of 1965/66 -1971/1972	2852.5	-	119	2213.1	-	-
1973	3938.6	11.67	164	2720	4.49	134
1974	4389.3	11.44	184	2652.1	- 2.50	130
1975	5230.5	19.16	219	2938.5	10.80	144
1976	6837.6	30.73	286	3563.1	21.26	175
1977	8643.1	26.41	362	4119.7	15.62	202
1978	10782	24.75	452	4479.4	8.73	220
1979	13492.8	25.14	565	5114.8	14.18	251
Average of 1973-1979	7616.3	-		3655.4	-	

a) Source: Ministry of Planning . Annual Reports, Cairo, Egypt:  
Author, 1965/1966 - 1979.

b) The rate of Change  $\gamma = \frac{S_{t+1} - S_t}{S_t}$

Table (2) : Net Agricultural income in nominal and real values 1970 - 1980 <sup>a</sup>

(Value in thousand pounds)

Year	Nominal price			Real price		
	Net agric.	Rate of Change	Index number	Net agric.	Rate of change	Index number
1970	783000	-	100	600000	-	100
1971	817000	4.34	104	610157	1.69	102
1972	905000	10.77	116	667897	9.46	111
Average of 1970-1972	835000	-	107	626407	-	104
1973	1020000	12.71	130	704420	5.47	117
1974	1233060	20.89	157	745051	5.77	124
1975	1382020	12.08	177	776416	4.21	129
1976	1660623	20.16	212	865359	11.46	144
1977	1949973	17.42	249	929444	7.41	155
1978	2200742	12.86	281	914309	-1.63	152
1979	2634667	19.72	336	998737	9.23	166
1980	3196815	21.34	408	996513	-0.22	166
Average of 1973-1980	19097375	-	244	890736	-	148

a) Source: Ministry of Agriculture. Records of the Research Institute of Agricultural Economics and Statistics. Cairo, Egypt : Author, 1970 - 1980.

Table (3): Input Subsidies In nominal and real prices  
1970 - 1980.<sup>a</sup>

(Value in thousand pounds)

Year	Nominal price			Real price		
	Value of inputs	Rate of Change	Index number	Value of inputs	Rate of Change	Index number
1970	265000	-	100	203065	-	100
1971	306000	15.47	115	228529	12.54	113
1972	318000	3.92	120	234686	2.69	116
Average of 1970-1972	296333	-	112	222305	-	109
1973	371000	16.67	140	256215	9.17	126
1974	453320	22.19	171	273909	6.91	135
1975	488166	7.69	124	274251	0.12	135
1976	539949	10.61	204	281370	2.60	139
1977	676482	25.29	256	322441	14.60	159
1978	1056432	56.17	399	438900	36.12	216
1979	887130	-16.03	335	336289	-23.38	166
1980	1054726	18.89	398	328780	-2.23	162
Average of 1973-1980	690901	-	261	322249	-	159

a) Source: Ministry of Agriculture. Records of the Research Institute of Agricultural Production Economics. Egypt: Author, 1970 - 1980 .

Table (4): Value of Input subsidies in nominal and real prices 1970/1971 - 1979<sup>a</sup>

(value in thousand pounds)

Year	Nominal price			Real price		
	Input sub- sidies	Rate of change	Index number	Input subsidies	Rate of Change	Index number
1970/1971	427	-	100	318.90	-	100
1971/1972	13684	3104.68	3205	10098.90	-	3167
Average 1970-1972	5644.4	-	1322	4167.12	-	1307
1973	17627	28.81	4122	12173.3	20.54	3817
1974	71827	307.48	11821	43400	256.52	13609
1975	110824	54.29	25954	62260.7	43.46	19524
1976	69576	37.22	16294	36256.4	41.77	11369
1977	63960	8.07	14979	30486.2	15.91	8439
1978	65188	1.92	15267	27082.7	11.16	8493
1979	96380	47.85	22571	36535.3	34.90	11457
Average of 1973-1979	70768.9	-	16574	35526.6	-	11140

<sup>a</sup> Source: Ministry of Agriculture. Records of Agricultural production Department. Cairo, Egypt: Author 1970 - 1979.

Table (5) : Subsidies of Domestic and Imported Fertilizers  
1970 - 1980/1981<sup>a</sup>

Year	Nominal Price						Real Price					
	Imported		Domestic		Total		Imported		Domestic		Total	
	Subsidies	Rate of Change	Subsidies	Rate of Change	Subsidies	Rate of Change	Subsidies	Rate of Change	Subsidies	Rate of Change	Subsidies	Rate of Change
1970 - 1971	7	-	-	-	7	-	5.2	-	-	-	5.2	-
1971 - 1972	70	900	1079	-	1149	16314.3	51.7	894	796.3	-	848	16208
Average of 1970 - 1972	30.5	-	431.6	-	462.4	-	22.9	-	318.0	-	341.3	-
1973	495	607.14	980	-9.18	1475	28.37	341.8	561.1	676.8	-15	1018.6	20.1
1974	46263	9246	3671	274.6	49934	3285.5	27953.5	8.783	2218.1	227.7	30171.6	2862.1
1975	72271	56.2	627.6	71	78547	57.3	40601.7	45.2	3525.8	58.96	44127.5	46.3
1976	30700	-57.5	9134	45.5	39834	-49.3	15997.9	-60.6	4759.8	35	20757.7	-53
1977	10715	-65.1	13252	45.1	23967	-39.8	5107.2	-68.1	6316.5	32.7	11423.7	-45
1978	12008	12.07	10733	-19	22741	-5.1	5988.8	-2.3	4459.1	-29.4	9447.9	-17.3
1979	42791	256.35	19491	81.6	62282	173.9	16221.	225.1	7388.6	65.7	23609.6	149.9
1980 - 1981	147178	243.95	84060	331.3	231238	271.3	45878.4	182.8	26203.2	254.6	72081.6	205.3
Average 73	45302.6	-	18449.6	-	63752.2	-	19636.3	-	6943.5	-	26579.8	-

<sup>a</sup>Source : Ministry of Agriculture. Fertilizer Department. Cairo, Egypt: Author, 1970 - 1981.

Table (6) : Average Cost , the production of price and the subsidies per pound .

(per ton of fertilizers 1977 -1983<sup>a</sup>)

Year	Cost per (ton)	Production Price (pound)	Subsidies (pound)	Index numbers		
				Cost per (ton)	Price	Subsidies
1977	45.70	25.08	20.62	100	100	100
1978	48.81	26.41	22.40	107	105	107
1979	56.74	31.41	25.33	124	125	123
1980	66.82	39.97	26.85	146	159	130
1981	71.82	39.97	31.85	157	159	154
1982	92.70	31.77	60.93	203	127	295
1983	92.93	34.28	58.65	203	137	284
Average of 1977-1983	67.93	32.70	35.23	149	130	171

<sup>a</sup> Source : Ministry of Agriculture Fertilizers Department , Cairo, Egypt: Author , 1977 - 1983.

Table (7) : The cotton besticide burden per pound is nominal and real prices 1974 - 1979<sup>a</sup>

Years	Nominal			Real		
	Farmers burden	Government burden	Total	Farmers burden	Government burden	Total
1974	19.2	19.2	38.4	11.6	11.6	23.2
1975	17.5	28.7	46.2	9.8	16.1	25.9
1976	16.2	26.9	43.1	8.4	14.0	22.4
1977	18.5	36.8	55.3	8.8	17.6	26.4
1978	15.5	29.8	45.3	6.4	12.4	18.8
1979	49.4	30.6	80.0	18.7	11.6	30.3

<sup>a</sup>Source: Central Agency for public Mobilization and Statistics (CAPMS). . " Allocation of Subsidies on Goods and Services " Cairo , Egypt : CAPMS, April 1979.

Table (8): Pesticide subsidies for all Crops 1977 - 1981<sup>a</sup>

	1977	1978	1979	1980	1981
Cotton			39.661	48.142	63.031
Rice grass				.295	.634
Onion				.295	.634
Soybean			-	.159	.105
Total			39.661	48.596	64.945

<sup>a</sup>Source: Finance and Agricultural Development Bank . Pesticide Department, Cairo, Egypt :  
Author, 1977 - 1981 .

Appendix C

Table (9) : Time equations for the major Variables in nominal prices<sup>a</sup>.

Variable	Equation	Signi- ficance level 0.01	Average of the period
Gross National product 1965/1966-1979	$\hat{Y} = -280.47 + 735.33 X$ (943.52) (110.82)	Sig. <sup>b</sup>	5234.38
Gross National product 1965/1966-1971/ 72	$Y = 2036.43 + 204.04 X$ (113.18) (25.35)	Sig.	2852.49
Gross National product 1973 - 1979	$Y = 1207.86 + 1602.14 X$ (748.20) (167.30)	Sig.	7616.27
Cost per ton of fertilizers pound 1977-83	$Y = 33.00 + 8.73 X$ (3.83) (4.53)	non- <sup>c</sup> sig.	67.93
Production price (pound) 1977 - 1983	$Y = 26.00 + 1.67 X$ (4.31) (0.96)	non- sig.	32.70
Subsidies per ton of Domestic fert. (pound) 1977 - 1983	$Y = 6.99 + 7.06 X$ (7.28) (1.63)	Sig.	35.23

Table (9) : Continued.

Variable	Equation	Signi- ficance level 0.01	Average of the period
Farmer's burden (million pounds) 1974 - 1979	$Y = 7.99 + 4.21 X$ (9.80) (2.52)	non- Sig.	22.72
Government burden (million pounds) 1974 - 1979	$Y = 21.65 + 2.00 X$ (6.00) (1.54)	non- Sig.	28.67
Government burden in pesticides million pounds 1974 - 1979	$Y = 29.63 + 6.21 X$ (9.98) (2.56)	non- Sig.	51.38
Imported ferti. (million pounds) 1973 -1980/81	$Y = 1.98 + 9.63 X$ (34.47) (6.83)	non- Sig.	45.30
Domestic ferti. million pounds 1973-1980/81	$Y = 17.88 + 8.07 X$ (15.63) (3.10)	non- Sig.	18.45
Total Subsidies (million pounds) 1973 -1980/1981	$Y = 15.90 + 17.70 X$ (48.25) (9.56)	non- Sig.	63.75
Not agricultural Income (million pounds) 1973-1980	$Y = 570.86 + 297.56 X$ (215.41) (41.66)	Sig.	1909.74
Input Subsidies (million pounds) 1973 - 1979	$Y = 45.61 + 6.29 X$ (22.20) (5.38)	70.77	
Inputs (million pounds) 1973-80	$Y = 218.57 + 104.93 X$ (80.88) (16.02)	690.90	

a Source: Calculated upon data in tables (1)-(8).

b Sig. Stands for significant.

c non-Sig. Stands for non-significant .

Table (10) : Time equations for the major variables  
in real prices<sup>a</sup> .

Variable	Equation	Signifi- cance level 0.01	Average of the period
Cross nation product 1965/1966 -1979	$\hat{Y} = 1267.51 + 222.23 X$ (225.70) (26.51)	Sig. <sup>b</sup>	2934.22
Cross national prod- uct 1965/66-1971/72	$\hat{Y} = 1755.89 + 114.30 X$ (104.65) (23.40)	Sig.	2213.07
Gross national prod- uct 1973 - 1979	$\hat{Y} = 1938.2 + 429.29 X$ (195.26) (43.66)	Sig.	3655.37
Farmers' burden (pound per feddan) 1974 - 1979	$\hat{Y} = 8.05 + 0.73 X$ (4.26) (1.09)	non- Sig. <sup>c</sup>	10.62
Government burden	$\hat{Y} = 14.63 - 0.21 X$ (2.57) ( .66)	non- Sig.	13.88
Total government burden in cotton pest control	$\hat{Y} = 22.68 + 0.52 X$ (3.98) (1.02)	non- sig.	24.5
Imported fertilizers 1973 - 1980/1981	$\hat{Y} = 12.01 + 1.69 X$ (15.19 ) (3.01)	non sig.	19.64
Domestic fertilizers 1973 - 1980/1981	$\hat{Y} = -4.25 + 2.49 X$ (4.88) (0.966)	non- sig.	6.94
Total subsidies 1973 -1980/1981	$\hat{Y} = 7.76 + 4.18 X$ (18.69) (3.70)	non- sig.	26.58

Table (10) : Continued

Variable	Equation	Signifi- icance level 0.01	Average of the period
Net agricultural income 1973-1980	$Y = 663.22 + 45.12 X$ (22.67) (4.49)	Sig.	866.28
Agricultural Subsidies 1973 - 1979	$Y = 34.22 + 0.31 X$ (14.23) (3.18)	non- sig.	35.46
Value of inputs 1973 - 1980	$241.44 + 16.13 X$ (39.81) (7.88)	non- sig.	314.62

<sup>a</sup>Source : Calculated upon data in tables (1) -(8) .

<sup>b</sup>sig. Stands for significant

<sup>c</sup>non-sig. Stands for non-significant.



