A CGE Analysis of the Economic Impact of Increasing the Production Efficiency Parameter in the Agriculture Sector on the Algerian Economy

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Abstract

The principal focus of the study is to show the Economic Impact of Increasing the Production Efficiency Parameter in the Agriculture Sector on the Algerian Economy by using a computable general equilibrium Analysis. In this study, different types of simulation are also considered in order to test the response of the economy, for that we used two scenario. The principal objective of this simulation is to examine the linkages of agricultural productivity growth on non-agricultural sectors. Model results indicate that a shift in the scale parameter by 10 percent in the value added function pushes total output, exports, imports and consumption up. Increase in output and employment in the non-agriculture sector is also significant. The effects are more positive when tariff is removed.
Keywords : Agriculture, SAM, Algerian Economy, Computable General Equilibrium Model.

الملخص: الغرض الرئيسي لهذه الدراسة هو إظهار التأثير الاقتصادي لزيادة معلمة كفاءة الإنتاج في قطاع الزراعة على الاقتصاد الجزائري باستخدام تحليل التوازن العام القابل للحساب. في هذه الدراسة، يتم أيضًا دراسة أنواع مختلفة من المحاكاة لاختبار استجابة الاقتصاد، من أجل ذلك استخدمنا سيناريوهين اثنين. الهدف الرئيسي لهذه المحاكاة هو فحص روابط نمو الإنتاجية الزراعية في القطاعات غير الزراعية. تشير نتائج النموذج إلى أن التغير في مستوى المعلمة بنسبة 10٪ في دالة القيمة المضافة يدفع إجمالي الإنتاج والصادرات والواردات والاستهلاك إلى الزيادة. كما أن الزيادة في الإنتاج والعمالة في القطاع غير الزراعي مهمة أيضًا. الآثار أكثر إيجابية عندما يتم إزالة التعريفة الجمركية.
الكلمات المفتاحية: الفلاحة، مصفوفة المحاسبة الاجتماعية، الاقتصاد الجزائري، نموذج التوازن العام القابل للحساب.

1- Introduction

Agricultural sectors play a key role in the economics of any country. Land as an input to agricultural production is one of the most important links between economy and the biosphere, representing a direct projection of human action on the natural environment. Agriculture also plays an important role in emitting and storing greenhouse gases. To consistently investigate climate policy and future pathways for the economic and natural environment, a realistic representation of agricultural land use is essential. Computable General Equilibrium (CGE) models have increasingly been used for this purpose. CGE

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models simulate the simultaneous equilibrium in a set of interdependent markets, and are especially suited to analyze agricultural markets from a global perspective. However, modeling agricultural sectors in CGE models is not a trivial task, mainly because of differences in temporal and geographic aggregation scales.

Since early 1980s, a massive amount of work has been done using this modeling technique with the help of sophisticated computer softwares, such as GAMS, and General Algebraic Modelling Package (GAMPACK) etc. Area of application of this modeling technique has been expending and the application of it in explaining environmental issues is more frequent now. For example, THIELE and Wiebelt (1993) have used CGE model in explaining the causes of over exploitation and depletion of rain forests in Cameroon. Wiebelt (1994) has explained the role of macro-economic, sectoral, and regional policies to protect the rain forests in Brazil with the help of a CGE model.San, Lofgren and Robinson (2000) have also used a CGE model to analyse the impact of tax policy on the forestation in sumatra regional economy, Indonesia. Some of the studies similar to the model developed for this study purpose are presented here briefly. Lofgran (2001b) has developed a model for the study of trade policy issues in Malawi. Wobst (2001) has developed a model for Tanzania to analyse the impact of structural adjustment policies on overall economic growth, sectoral performance, welfare, and income distribution, in this study, trade and exchange rate policy simulations were carried out with special emphasis on agriculture.Sapkota and Sharma (1999) have presented a CGE model for Nepal where impact of trade policy liberalization on different household groups in analyzed. Siddiqui and Iqbal (1999) have developed a similar type of CGE model to analyze the impacts of tariff reduction on the income distribution on different household groups.

CGE models are a class of economy wide models that are widely used for policy analysis in developing countries. This paper provides a detailed documentation of an applied Computable General Equilibrium (CGE) model of Algeria. The purpose of this paper is to serve as a source of background information for analysts using the model in the context of the current project and in the future.

The applied Algerian model can be used for analyses in a relatively wide range of areas, including agricultural, trade, and tax and subsidy policies. It is characterized by a detailed treatment of the labor market and households, permitting model simulations to generate information about the disaggregated impact of policies on household welfare.

As part of the project research activities, the model will be used to analyze trade, fiscal policy, and agricultural issues. The model is built around a 2013 Social Accounting Matrix (SAM) for Algeria, developed in the context of the current project.

Like most other CGE models, the Algerian CGE model is solved in a comparative static mode. It provides a simulation laboratory for doing controlled experiments, changing policies and other exogenous conditions, and measuring the impact of these changes. Each solution provides a full set of economic indicators, including household incomes; prices, supplies, and demands for factors and commodities (including foreign trade for the latter); and macroeconomic data.

The model is structured in the tradition of trade-focused CGE models of developing countries described in Dervis, de Melo, and Robinson (1982). It is a further development of the stylized CGE model found in Löfgren (2000). To make it appropriate for applied policy analysis, more advanced features have been added, drawing on recent research at IFPRI (see Harris et al. 2000). Most importantly, the model has an explicit treatment of trade inputs, which are demanded whenever a commodity is distributed domestically as part of international trade (to or from the border) or as part of domestic trade (from domestic supplier to domestic demander). This feature is particularly important in many African settings where an underdeveloped transport network leads to high transportation costs (cf.

Ahmed and Rustagi 1993). In addition, the model can handle non-produced imports, i.e., commodities for which the total supply stems from imports. Compared to the stylized CGE model, the current model also has more advanced functional forms for production and consumption to enable it to better capture observed real- world behavior.

The model is built around a 2013 SAM for Algeria. Most of the model parameters are set endogenously in a manner that assures that the base solution to the model exactly reproduces the values in the SAM – the model is “calibrated” to the SAM. (The remaining parameters, a set of elasticities, are set exogenously.) However, as opposed to the SAM, which is a data framework that records payments, the model contains the behavioral and technical relationships that underlie these payments (Thorbecke 1985).

2- Structure of the Model

This study is fanatical to estimate impacts (i.e. baseline estimation and simulation target) of external price shocks and foreign trade policies on the Algerian economy and quantifies the linkages between recession and economic instability**.** The Algerian computable general equilibrium model is presented in this section, which is a set of non-linear simultaneous equations followed by Lofgren, et al (2002), where the number of equation is equal to the number of endogenous variables. This section introduces the framework of the CGE model and algorithm for solving the objectives. The equations are classified in six different blocks, system constraints block as follows.

A-Price Block

The price system of the model is rich, primarily because of the assumed quality differences among commodities of different origins and destinations (exports, imports, and domestic outputs used domestically). The price block consists of equations in which endogenous model prices are linked to other prices (endogenous or exogenous) and to non-price model variables.

Import Price

$$PM_c = pwm_c(1 + tm_c) \cdot EXR \tag{1}$$

Where PM_c is import price in LCU (local-currency units) including transaction costs, tm_c is the import tariff rate, pwm_c is the import price in FCU (foreign-currency units), EXR is the exchange rate (LCU per FCU).

The import price in LCU (local-currency units) is the price paid by domestic users for imported commodities (exclusive of the sales tax). Equation (1) states that it is a transformation of the world price of these imports, considering the exchange rate and import tariffs plus transaction costs (the cost of trade inputs needed to move the commodity from the border to the demander) per unit of the import.

Export Price

$$PE_c = pwe_c(1 + te_c) \cdot EXR \tag{2}$$

Where $PE_c$the export price (LCU) is, te_c is the export tax rate, pwe_c is the export price (FCU).The export price in LCU is the price received by domestic producers when they sell their output in export markets. This equation is similar in structure to the import price definition. The main difference is that the tax and the cost of trade inputs reduce the price received by the domestic producers of exports (instead of adding to the price paid by domestic demandersof imports).

Absorption

The absorption PQ_cQQ_c by the domestic demanders is the function of quantity supplied to the domestic market can be expressed as:

$$PQ_cQQ_c = [PD_cQD_c + PM_cQM_c](1 + tq_c) \tag{3}$$

Where: PQ_c=composite commodity price, QQ_c = quantity supplied to domestic market, PD_c= domestic price of domestic output, QD_c= quantity of domestic output sold domestically and tq_c= sales tax rate.

Similarly the domestic output value, activity price and value added can be expressed as:

$$PX_c \cdot QX_c = PD_cQD_c + PE_cQE_c \tag{4}$$

Activity price

$$PA_a = \sum_{c\in C} PX_{ac}\, \theta_{ac} \tag{5}$$

Value added price

$$PVA_a = PA_a - \sum_{c\in C} PQ_c\, ica_{ca} \tag{6}$$

Where: PX_c= producer price, QX_c= quantity of domestic output, PVA_a= value added price, PA_a= activity price, θ_{ac}= yield of commodity c per unit of activity a, and$c \in C$ where C is commodities.

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B-Production and trade block

The production and trade block covers four categories: domestic production and input use; the allocation of domestic output to home consumption, the domestic market, and exports; the aggregation of supply to the domestic market (from imports and domestic output sold domestically); and the definition of the demand for trade inputs that is generated by the distribution process. Production is carried out by activities that are assumed to maximize profits subject to their technology, taking prices (for their outputs, intermediate inputs, and factors) as given. In other words, it acts in a perfectly competitive setting. This block defines production technology and demand for factors as well as CET (constant elasticity of transformation) functions combining exports and domestic sales, export supply functions and import demand and CES (constant elasticity of substitution) aggregation functions. This block contains several functions and equations for the production side of the economy as follows:

Activity production function

$$QA_c = ad_a \prod_{f\in F} QF_{fa}^{\alpha_{fa}} \tag{7}$$

Factor demand

$$\mathrm{WF_f WFDIST_{fa}} = \frac{\mathrm{a_{fa} PVA_a QA_a}}{\mathrm{QF_{fa}}} \tag{8}$$

Intermediate demand

$$\mathrm{QINT_{ca}} = \mathrm{ica_a QA_a} \tag{9}$$

Output function

$$\mathrm{QX_c} = \sum_{a \epsilon A} \theta_{ac}\, \mathrm{QA_a} \tag{10}$$

Composite supply (Armington) functions

$$\mathrm{QQ_c} = \mathrm{aq_c} \left(\delta_c^q \mathrm{QM_c}^{-p_c^q} + \left(1 - \delta_c^q\right) \mathrm{QD_c}^{-p_c^q} \right)^{\frac{-1}{p_c^q}} \tag{11}$$

Import-domestic demand ratio

$$\frac{\mathrm{QM_c}}{\mathrm{QD_c}} = \left(\frac{\mathrm{PD_c}}{\mathrm{PM_c}} \frac{\delta_c^q}{\left(1 - \delta_c^q\right)} \right)^{\frac{1}{1+p_c^q}} - 1 < p_c^q < \infty \tag{12}$$

Composite supply for non-imported commodities

$$\mathrm{QQ_c} = \mathrm{QD_c} \tag{13}$$

Output transformation function

$$QX_c = at_c \left(\delta_c^t QE_c^{p_c^t} + (1 - \delta_c^t) QD_c^{p_c^t} \right)^{\frac{1}{p_c^t}} \tag{14}$$

Export-domestic demand ratio

$$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PD_c} \frac{(1-\delta_c^t)}{\delta_c^t} \right)^{\frac{1}{p_c^t - 1}} - 1 < p_c^t < \infty \tag{15}$$

Output transformation for non-exported commodities

$$QX_c = QD_c \tag{16}$$

Where: QA_c= activity level, $QF_{fa}^{\alpha_{fa}}$= quantity demanded of factor f by activity a, $WFDIST_{fa}$= wage distortion factor for f in a, $QINT_c$= quantity of c used in activity a, WF_f= average wage (rental rate) of factor f, ad_a= production function efficiency parameter, ica_a= *quantity of c as intermediate input per unit of activity a,* qg_c = *government commodity demand,* δ_c^q= *share parameter for composite supply (Armington)function,* δ_c^t= *share parameter for output transformation (CET) function,* p_c^q= *exponent for composite supply (Armington)function,* at_c= *shift parameter for output transformation (CET) function, ,* p_c^t=*exponent for output transformation (CET) function* and$f \in F$ is the fictional from where F is factors with f being labor or capital.

C-Institution block

This block consists of equations that map the flow of income from value added to institutions and ultimately to households. These equations fill out the inter-institutional entries in the SAM (Social Accounting Matrix of Algeria. This block contains several functions and equations for the institution side of the economy as follows:

Factor income

$$YF_{hf} = shry_{hf} \sum_{a \in A} WF_f WFDIST_{fa} QF_{fa} \tag{17}$$

Non-government domestic institution

$$YH_h = \sum_{f \in F} YF_{hf} + tr_{h,gov} + EXR \cdot tr_{h,row} \tag{18}$$

Household consumption demand

$$QH_{ch} = \frac{\beta_{ch}(1 - mps_h)(1 - ty_h)YH_h}{PQ_c} \tag{19}$$

Investment demand

$$QINV_c = qinv_c \cdot IADJ \tag{20}$$

Government revenue

$$YG = \sum_{h \in H} ty_h \cdot YH_h + EXR \cdot tr_{gov,row} + \sum_{c \in C} tq_c \left(PD_c QD_c + PM_c QM_c\right) + \sum_{c \in CM} tm_c EXR \cdot pwmc_c \cdot QM_c + \sum_{c \in CE} te_c \, EXR \cdot pwe_c \cdot QE_c + ygi \tag{21}$$

Government expenditures

$$EG = \sum_{h \in H} tr_{h,gov} + \sum_{c \in CE} PQ_c \cdot qg_c \tag{22}$$

Where : YF_{hf}= transfer of income to h from f, WF_f= average wage (rental rate) of factor f,‘ $WFDIST_{fa}$= wage distortion factor for f in a, QF_{fa}= quantity demanded of factor f by activity a, YH_h= income of h, $tr_{h,gov}$= government transfer from household, QH_{ch} = quantity of consumption of commodity c by h, $QINV_c$= quantity of investment demand, $IADJ$= investment adjustment factor, YG= government revenue, $shry_{hf}$= share of the income from factor f in h, mps_h= share of disposable income to savings, ty_h= rate of income tax for h, $qinv_c$= base-year investment demand, $tr_{gov,row}$= government transfer to rest of the world and qg_c= government commodity demand.

D-System constraints block

This block defines the constraints that are must be satisfied by the economy as a whole. The model's micro constraints apply to individual factor and commodity markets. The system constrains in an economy as follows:

Factor markets

$$\sum_{\propto \in A} QF_{fa} = QFS_f \tag{23}$$

Composite commodity markets

$$QQ_c = \sum_{\propto \in A} QINT_{ca} + \sum_{h \in H} QH_{ch} + qg_c + QINV_c \tag{24}$$

Current account balance for ROW

$$\sum_{c \in CE} pwe_c \cdot QE_c + \sum_{i \in I} tr_{i.row} + TASV = \sum_{c \in CM} pwm_c \cdot QM_c + irepat + yfrepat_f \tag{25}$$

Savings-Investment balance

$$\sum_{h\in H} mps_h \cdot (1-ty_h)YH_h + (YG - EG) + EXR \cdot FSAV = ygi + EXR \cdot irepat + \sum_{c\in C} PQ_c \cdot QINV_c + WALRAS \qquad (26)$$

Price normalization

$$\sum_{c\in C} PQ_c \cdot cwts_c = cpi \qquad (27)$$

Where: QFS_f *= supply of factor f,* $QINT_{ca}$ *= quantity of c used in activity a,* $FSAV$ *= foreign savings,* $irepat$ *= investment surplus to ROW,* $yfrepat_f$ *= factor income to ROW, EG= government expenditure,walras= dummy variable,* $tr_{i.row}$ *= transfer to institution to ROW,* cpi *= consumer price index,*$cwts_c$ = commodity weight in CPI.

The basic model of my study consists 14 sectors, four institutional agents, two primary factors production, and the rest of the world (ROW). The 14 sectors where aggregated from the 2013 Algerian Input-Output table that initially comprised of 22 sectors. The benchmark model representing the baseline economy is constructed using the social accounting matrix of Algeria 2013 as shown in Table 1. For the sectors each sector is assumed to produce a single composite commodity for the domestic market and for ROW. There are four domestic final demand sectors. They are household, enterprise, government and an agent that allocate saving over investment demand from all production sectors. These institutions obtain products from both domestic production sectors and ROW (imports).

Table 1: Sectoral Aggregation of Algerian Social Accounting Matrix (SAM) for year 2013(DZD thousand)

	A	C	L	C	H	E	G	S-I	Ytax	Tva	Tariff	ROW	Total
Activities		13759741											13759741
Commodities	4403061				3922963		1862704	4545845				3427170	18161745
Labor	8273639												8273640
Capital													
Household				5286439	7052	29228	1102359					25387	6450466
Enterprises				2986615		5277	542227					14000	3548120
Government	1083040				797552		701887		1984716	542063	169055	598871	5877188
Saving-Investment					1514413	1601408	1430023						4545845
Income tax					205540	1779176							1984716
Sales tax		542063											542063
Tariff		169055											169055
ROW		3690885	585		2943	133029	237986						4065430
Total	13759741	18161745		8273640	6450466	3548120	5877188	4545845	1984716	542063	169055	4065430	

Source: Authors calculation

All producers are assumed to maximize profits and each faces a two-level nested Leontief and Cobb-Douglas production function (Lofgren, et al, 2002). Each commodity is produced by Leontief technology using intermediate input from various production sectors and primary inputs (labour and capital). The primary inputs are determined by Cobb-Douglas production function. To capture features of intra-industry trade for a particular sector, domestic products and products from ROW within the sector are assumed to be imperfect substitutes and their allocations are determined according to Armington CES (constant elasticity of substitution) function. On the supply side, output allocation between the domestic market and ROW are according to constant elasticity of transformation (CEF) function. On the demand side, a single household is assumed. The household is assumed to maximize utility according to Cobb-Douglas utility function subject to income constraint. Consumption demand for a sector's product is also a CES function of the domestically produced and imported product. Government expenditure is specified as exogenously determined. Sectoral capital investments are assumed to be allocated in fixed proportions among various sectors. In terms of macroeconomic closure, investment is saving-driven and capital is assumed mobile across activities and fully employed. Labor is also fully mobile at fixed wage. Both factors are available in fixed supplies. Factor incomes are distributed to household and enterprise on the basis of fixed shares (derived from base-year data). Outputs are demanded by the final demand agents at market-cleaning prices and exchange rate is assumed flexible.

3- Simulation design and model results

3-1 Description of the simulation

This section presents the results obtained from different policy simulations carried out using the CGE model developed for this study purpose. The simulations carried out are mostly based on the realistic situation of the economy and tried to fit with the trend of the economy.

The scenario 1, the impact of technological change in the agricultural sector is carried out by changing the efficiency parameter in the value-added function for the agriculture sector, in scenario 2, simultaneously increasing the efficiency by 10 percent and elimination the tariff in all importing sectors. . The principal objective of this simulation is to examine the linkages of agricultural productivity growth on non-agricultural sectors. Simulation experiments are listed in table and the corresponding simulation results are presented sequentially.

Table 2: scenario codes and definition of the simulation

Scenario codes	Simulation specifications
Scenario 1	Increasing the production efficiency parameter in the agriculture sector by 10 percent to test the impacts on the other sectors of the economy.
Scenario 2	Simultaneously increasing the efficiency by 10 percent and elimination the tariff in all importing sectors.

3-2 Model results and discussion

A CGE model is used to analyse Algerian's economic situation if the country moves further to more improve of the agriculture sector and how the economy could change with this improvement. The principal database for the model is the input output table of Algeria for 2013, from which 38x38 social accounting matrix is construction using other data.

Model results indicate that:

Effects on macroeconomic variables: The technological change simulated in the CGE model is assumed to be neutral and technological change is considered by increasing the scale parameter of the value added function exogenously in each of the agricultural sectors. The positive effect of the agriculture productivity growth can be seen in the increase in both the household and government income. Household's and government's incomes increase by 4.13 and 5.67percent respectively (table 1). GDP at factor cost (total value added) also increases by 4.64 percent. This agricultural productivity growth scenario is combined with trade liberalisation scenario by eliminating tariff in all the importing sectors, the combined scenario shows a further improvement in the household consumption to 5.58 percent. GDP increases further and agricultural productivity increase causes a transfer of resources from agriculture to non-agricultural production.

Table1: Effect of 10 percent increase in shift parameter on macroeconomic variables

	Scen1	Scen2
Household income	4.13	5.58
GDP	4.646635	6.627248
Government income	5.672607	-3.62542
Government saving	14.3768	-19.2789
Private Consumption	4.0721	7.067186
Real balance of trade	-1.2487	-3.20725
Total investment	8.423322	-4.37504

Source: The authors' calculation by using GAMS simulation results

In the combined scenario, the change in the terms of trade shows an increase in the both the exports and imports. But the increase in imports is more than the increase in exports, causing a deterioration of the real balance of trade (Table1).

Effects on domestic output and trade:

The productivity increase in agriculture causes an increase in total output and GDP at factors costs by 5.65 and 2.81 percents respectively. The increase is further boosted by tariff removal, but interestingly the increase in productivity in agriculture pushes the output in almost all sectors in the economy up, explaining a strong relationship between agriculture and non-agriculture. In scenario 2, aggregate agricultural output increases by3.21 percent, and the same in the aggregate industry and aggregate services. In the combined scenario, the growth in industrial output is higher than the agricultural output. This is because the industrial sector uses more imported inputs than the agriculture and the elimination of tariff further boosts industrial output. But interestingly, the increase in the value added in agriculture is much higher than that of in industry in both scenarios. BOUTISTA and ROBINSON (1996) got similar findings for the CGE model of the Philippines, where the productivity growth in the crop sectors, simulated by changing the shift parameter in the value added function, causes increase in both the agriculture and non-agricultural sectors.

Table2: Effects of 10 percent increase in the shift parameter on output and value added

	Output		Value added	
Sectors	Scen1	Scen2	Scen1	Scen2
Total	5.652563	9.647533	2.814289	3.214289
SEC1-C	7.824446	9.815543	4.653804	5.653804
SEC2-C	6.543348	10.50143	2.622378	3.622378
SEC3-C	3.848465	5.870997	2.715655	3.715655
SEC4-C	6.84176	9.810529	1.823708	2.823708
SEC5-C	7.000231	10.97316	2.051282	2.951282
SEC6-C	7.155248	11.11441	3.076923	3.976923
SEC7-C	6.00524	9.973523	1.27186	2.07186
SEC8-C	7.065289	12.03126	1.608579	2.308579
SEC9-C	5.410123	7.390387	0.983607	1.183607
SEC10-C	3.218122	5.221748	3.680982	4.280982
SEC11-C	0.342774	3.375486	1.826484	2.226484
SEC12-C	5.155282	9.136904	3.837953	4.737953
SEC13-C	4.21881	6.211586	1.79704	2.59704
SEC14-C	3.621648	7.614583	2.423469	3.523469

Source: The authors' calculation by using GAMS simulation results

ROBINSON et al. (1998) has also conducted simulations for both the positive and negative productivity growths in the agricultural sectors in Indonesia using a CGE model. They have considered positive productivity growth as a proxy of adopting new technologies. The results showed an increase in production and value added in both agricultural and non-agricultural sectors, showing a strong relationship between agriculture with other economic sectors.

In scenario 1, exports and imports increase in almost all the sectors except in the textile, clothing and socks sector, where imports decrease. In scenario 1, total import increase by 13.6 percent with a consequent increase in agriculture by 9.86 percent. The corresponding increase in total export is 10.89 percent and in agriculture by 7.07 percent and Steel, mechanical, metallurgical and electrical industries sectors by 16.36 percent. In the combined scenario, both the exports and imports increase very sharply.

Table2: Effects of 10 percent increase in the shift parameter on exports and imports

	Imports		Exports	
Sectors	Scen1	Scen2	Scen1	Scen2
Total	13.60658	16.68963	10.89628	13.87149
SEC1-C	9.86466	12.85574	7.074825	9.065935
SEC2-C	30.41778	33.37165	13.51971	17.4788
SEC3-C	13.23504	16.25875	0	0
SEC4-C	0	0	0	0
SEC5-C	31.38345	35.35389	15.0201	17.99403
SEC6-C	28.45639	32.41228	16.36639	19.32645
SEC7-C	31.01819	30.98356	12.10556	16.07456
SEC8-C	23.62324	27.58724	13.46381	17.43046

SEC9-C	17.10388	16.08374	9.494743	12.4751
SEC10-C	17.83387	16.83786	3.914089	5.917613
SEC11-C	8.000815	8.036184	-1.22364	-2.1918
SEC12-C	30.12525	29.10509	10.97414	13.95622
SEC13-C	11.33106	10.32131	5.697018	8.689785
SEC14-C	23.92525	21.91757	3.890654	5.883755

Source: The authors' calculation by using GAMS simulation results

4- Conclusion

The impact of the change in productivity in agriculture influences the model economy positively at both sectorial and macro level. A shift in the scale parameter by 10 percent in the value added function is considered as a productivity improvement in the agriculture sector. This pushes total output, exports, imports and consumption up. Increase in output and employment in the non-agriculture sector is also significant. The effects are more positive when tariff is removed.

Economic performance in Algeria is still highly dependent on hydrocarbure production and productivity growth in agriculture has a highly positive impact on the whole of the economy. This way, the policies which increase investment in agriculture are particularly recommended.

Appropriate policy measures should be taken to reap the maximum benefit of the change in productivity in agriculture as the farming community responds positively with it. Under various types of institutional difficulties, market imperfections, lack of infrastructural facilities, without active policy support and careful participation of the government in the system, maximum benefit of the policy reform could not be reached to the farming community.

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