Sallam, Walid; Ahmed, Osama

The socio-economic assessment to evaluate the potentiality of developing the rural community in Upper Egypt

International Journal of Food and Agricutural Economics

Provided in Cooperation with:
Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Halle (Saale)

Suggested Citation: Sallam, Walid; Ahmed, Osama (2020) : The socio-economic assessment to evaluate the potentiality of developing the rural community in Upper Egypt, International Journal of Food and Agricutural Economics, ISSN 2149-3766, Niğde University, The Faculty of Economics and Administrative Sciences, Department of Economics, Niğde, Vol. 8, Iss. 2, pp. 143-165, https://www.foodandagriculturejournal.com/vol8.no2.pp143.pdf

This Version is available at:
https://hdl.handle.net/10419/217276

International Journal of Food and Agricultural Economics
ISSN 2147-8988, E-ISSN: 2149-3766
Vol. 8, No. 2, 2020, pp. 143-165

THE SOCIO-ECONOMIC ASSESSMENT TO EVALUATE THE POTENTIALITY OF DEVELOPING THE RURAL COMMUNITY IN UPPER EGYPT

Walid Sallam
Agricultural Economics Department, Faculty of Agriculture, Cairo University, Giza 12613, Egypt

Osama Ahmed
Agricultural Economics Department, Faculty of Agriculture, Cairo University, Giza 12613, Egypt & Department of Agricultural Markets, Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Theodor-Lieser-Str. 2, 06120 Halle (Saale), Germany, Email: naser@iamo.de

Abstract

This study evaluates the agricultural interventions related to productivity enhancement that may provide solutions to improve smallholder farmers' incomes. By applying Cost-Benefit Analysis (CBA) and conducting risk analysis using the Monte Carlo simulation technique for the proposed agricultural interventions, this paper evaluates the agricultural interventions in rural communities in Upper Egypt aimed at addressing the current challenges by moving from traditional farming to conservation agricultural. Results indicate that the interventions proposed are viable and have high positive socio-economic impacts on the farmers' livelihoods. The interventions will increase job opportunities in the target regions. Also, a very low probability of negative returns is shown. The probability of negative returns to the socio-economy aspects becomes almost zero when we add the economic benefit to society.
Keywords: *Agricultural interventions; increase farm productivity; improve livelihood; cost-benefit analysis*
JEL codes: *C02, C15, C53, C87, Q12, Q13*

1. Introduction:

To examine whether if the agricultural interventions will improve the livelihood of the smallholders' farmers, we are applied the CBA combined with risk analysis using the Monte Carlo simulation technique for this purpose. The proposed agricultural interventions will develop inclusive horticulture value chains in Upper Egypt that integrate smallholder farmers into the high-value export market. This study is focusing on three value chains, they are green onion, musk melons, and fresh strawberry.

1.1. Marketing Feasibility and Marketing Projections for Green Onions:

Specifically, the UK market is bi and growing for the Egyptian Green Onions. Egypt gains experience exporting Green Onions to the UK market and other EU markets. Value and volumes of Egypt's fresh Green Onions export showed a significant growth rates in the last 10 years. However, most of the Green Onions exports are sourced from the Northern part of Egypt with little focus on Upper Egypt. The largest market windows for the Egyptian fresh

Green Onions are mainly the early production to capture the market window between Southern (off-season) and Northern (on- season) hemisphere supplies. Moderate weather condition in Upper Egypt enjoys almost two to three weeks earlier than other geographic areas in Egypt. This unique microclimate with relatively inelastic demand, lack of supplies from other sources, and consumer's year round demand pushes export prices of fresh Green Onions during Upper Egypt production season high. This offer Upper Egypt Green onions farmer's excellent marketing opportunities. Green onions export from Upper Egypt is facing very little or no shadow window competition, enjoy excellent consistent growth rate for selling prices, and fits nicely the consumer consuming habits and preferences of the Green Onions.

Table 1.UK Green Onions Import Trade Indicators

	Trade Indicators										
Exporters	Imported value 2013 (USD thousand)	Share in Uni ted Kingdom's imports (%)	Imported quantity 2013 (Ton)	Unit value (USD/unit)	Imported growth in value between 2009-2013 (%, p.a.)	Imported growth in quantity between 2009-2013 (%, p.a.)	Imported growth in value between 2012-2013 (%, p.a.)	Ranking of partner countries in world exports	Share of partner countries in world exports (%)	Total export growth in value of partner countries between 2009-2013	**Tariff (estimated) app lied by United Kingdom (%)**
World	249,208	100	427,223	583	3	2	49		100	6	
Netherlands	90,197	36.2	183,661	491	2	2	61	1	18.8	9	0
Spain	55,293	22.2	134,085	412	3	7	83	7	4.1	6	0
Egypt	**25,180**	**10.1**	**24,573**	**1025**	**21**	**12**	**10**	**6**	**5.7**	**0**	**0**
Poland	21,498	8.6	36,415	590	6	4	39	14	1.2	-5	0
Mexico	19,633	7.9	6,882	2853	8	1	30	4	10.2	8	0
New Zealand	10,873	4.4	14,239	764	-14	-16	52	10	2.1	5	9.6
France	5,317	2.1	4,508	1179	10	2	60	8	2.8	10	0
Chile	4,355	1.7	4,752	916	-19	-27	-19	26	0.5	-1	0
Senegal	3,909	1.6	1,994	1960	151	148	195	46	0.1	121	0
Germany	2,912	1.2	2,858	1019	21	4	30	12	1.4	8	0
Ireland	2,842	1.1	3,205	887	-1	-3	31	69	0	-6	0
India	1,578	0.6	3,145	502	25	18	52	2	16.8	0	6.1
Australia	1,357	0.5	2,239	606	6	3	-36	18	0.8	7	9.6
Italy	813	0.3	803	1012	8	1	-10	13	1.3	3	0
Morocco	539	0.2	371	1453	145	182	369	30	0.3	49	0
Argentina	359	0.1	350	1026	-10	-27	-24	9	2.5	6	9.6
Kenya	358	0.1	77	4649	-17	-16	22	62	0	-10	0
Portugal	348	0.1	636	547	41	45	-3	56	0	39	0

Source: ITC calculations based on UN COMTRADE statistics

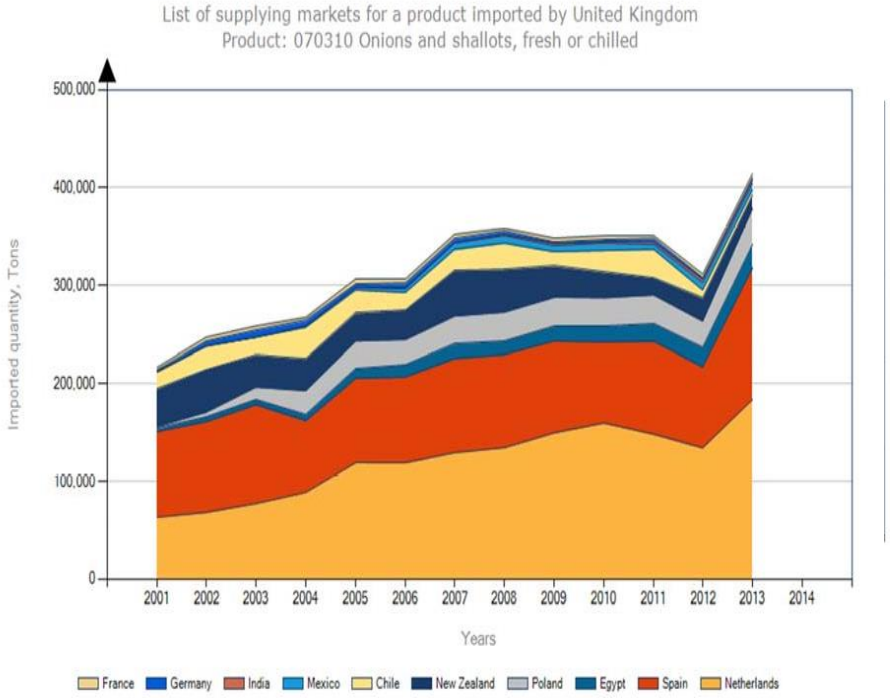


Figure 1.UK Green Onions Import Trend, Import Value in USD Thousand
Figure 2.UK Green Onions Import Trend, Import Volume in Ton

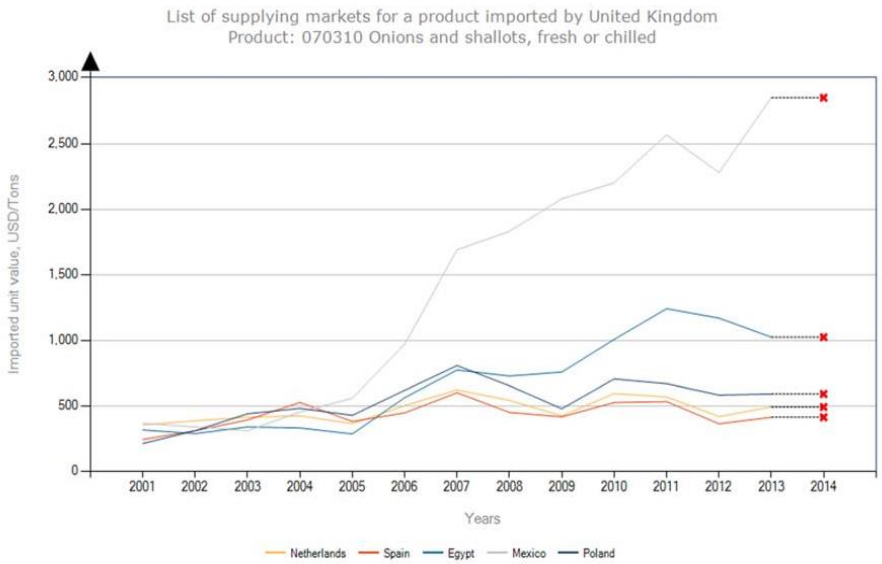


Figure 3.UK Green Onions Import Trend, Import Unit Value in US$/Ton

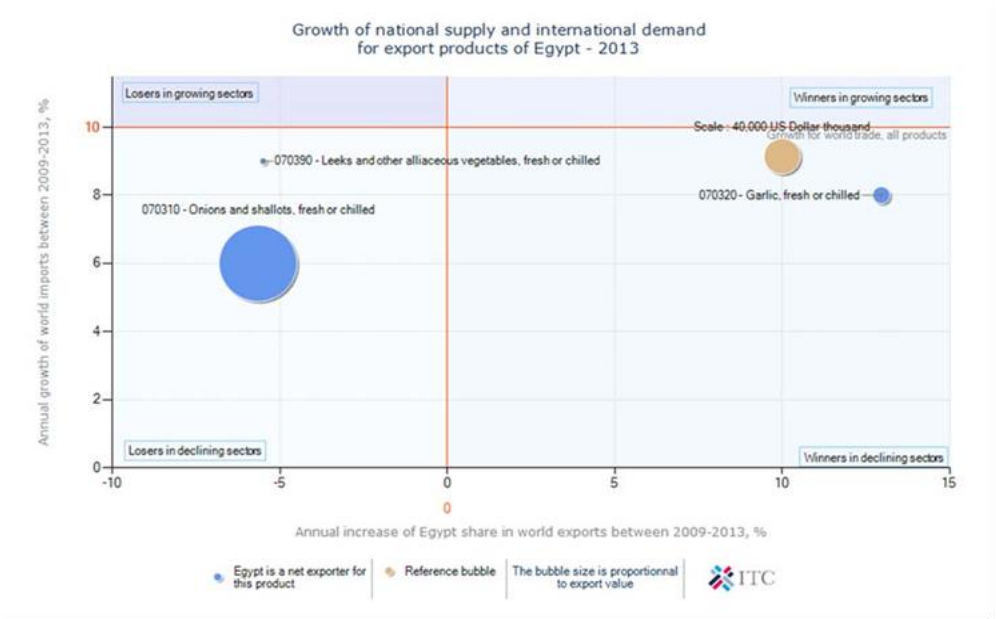


Figure 4. Egypt Key Item Export Potential

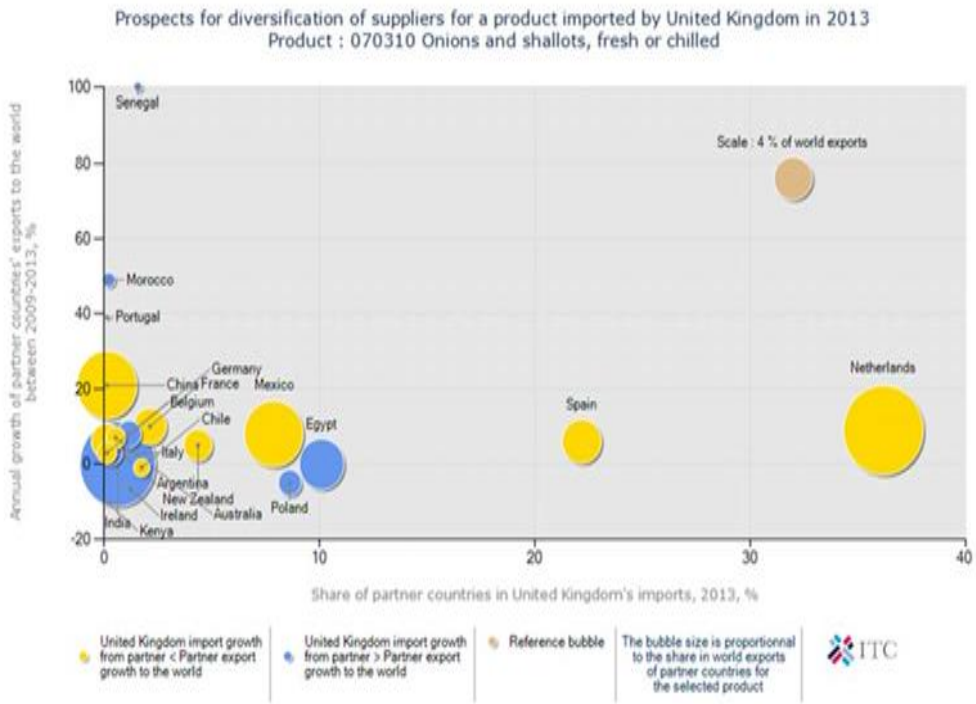


Figure 5. Prospects for Market Diversification for UK Green Onions Market

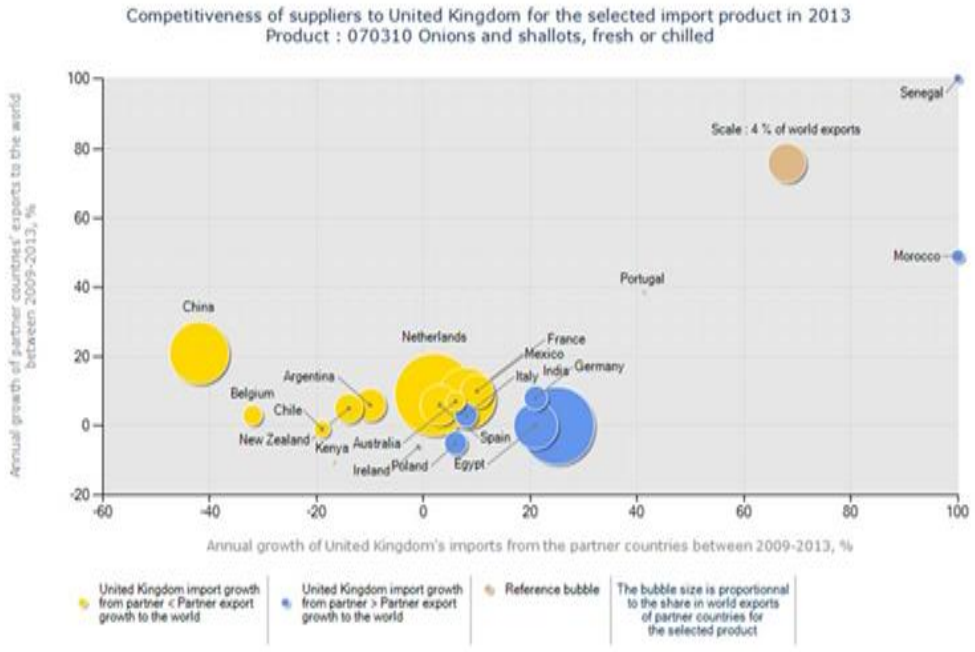


Figure 6. UK Green Onions Competitiveness of Suppliers

1.1. Marketing Feasibility and Marketing Projections for Musk Melons:

Export markets of the Musk Melons are growing. Egyptian exporters consider Musk melons have lucrative export opportunities in the EU, GCC, and Far-East markets. Value and volumes of Egypt's fresh Musk Melons export showed significant growth rates in the last 10 years. However, most of the Musk Melons exports are sourced from the Northern part of Egypt with little focus on Upper Egypt. The largest market windows for the Egyptian fresh Musk Melons are mainly the early production to capture the market window between Southern (off-season) Chile and South Africa and Northern (on-season) hemisphere Spain supplies. Moderate weather condition in Upper Egypt enables winter open field production. This unique microclimate with relatively inelastic demand, lack of supplies from other sources, and consumer's year round demand pushes export prices of fresh Musk Melons during Upper Egypt production season high.

Musk Melons export from Upper Egypt is facing very little or no shadow window competition, enjoy excellent consistent growth rate for selling prices, and fits nicely the consumer consuming habits and preferences of the seedless Musk Melons.

Table 2. Egypt Musk Melons Tarde Indicators

Importers	Trade Indicators										
	Exported value 2013 (USD thousand)	Share in Egypt's exp orts (%)	Exported quantity 2013	Unit value (USD/unit)	Exported growth in value between 2009-2013 (%,	Exported growth in quantity between 2009-	Exported growth in value between 2012-2013 (%,	Ranking of partner countries in world imports	Share of partner countries in world imports (%)	Total import growth in value of partner countri	**Tariff (estimated) faced by Egypt (%)**
World	17.706	100	79.007	224	2	31	29		100	5	
Kuwait	8.359	47.2	67.192	124	4	49	0	30	0.4	-3	0
Lebanon	2.408	13.6	3.217	749	83	96	837	54	0.1	14	
United Arab Emirates	1.589	9	1.632	974	-8	-11	-11	18	1	17	0
Iraq	1.057	6	1.124	940		27	766	56	0.1	-31	
Saudi Arabia	931	5.3	1.092	853	19	23	17	36	0.2		0
Romania	833	4.7	1.398	596	89	122	50	35	0.2	25	0
Libya	325	1.8	427	761	158	57	1	37	0.2	232	0
Qatar	318	1.8	446	713	67	95	108	42	0.2	5	0
Bahrain	317	1.8	393	807	35	45	-1	53	0.1	29	0
Hungary	274	1.5	476	576	-63	-29		45	0.1	-10	0
Mauritius	235	1.3	104	2.260	46	27	34	75	0	1	0
Czech Rep.	225	1.3	378	595				19	1	1	0
Russian Fed.	194	1.1	302	642	-36	-40	1392	25	0.6	-37	3.6

Sources: ITC calculations based on UN COMTRADE statistics.

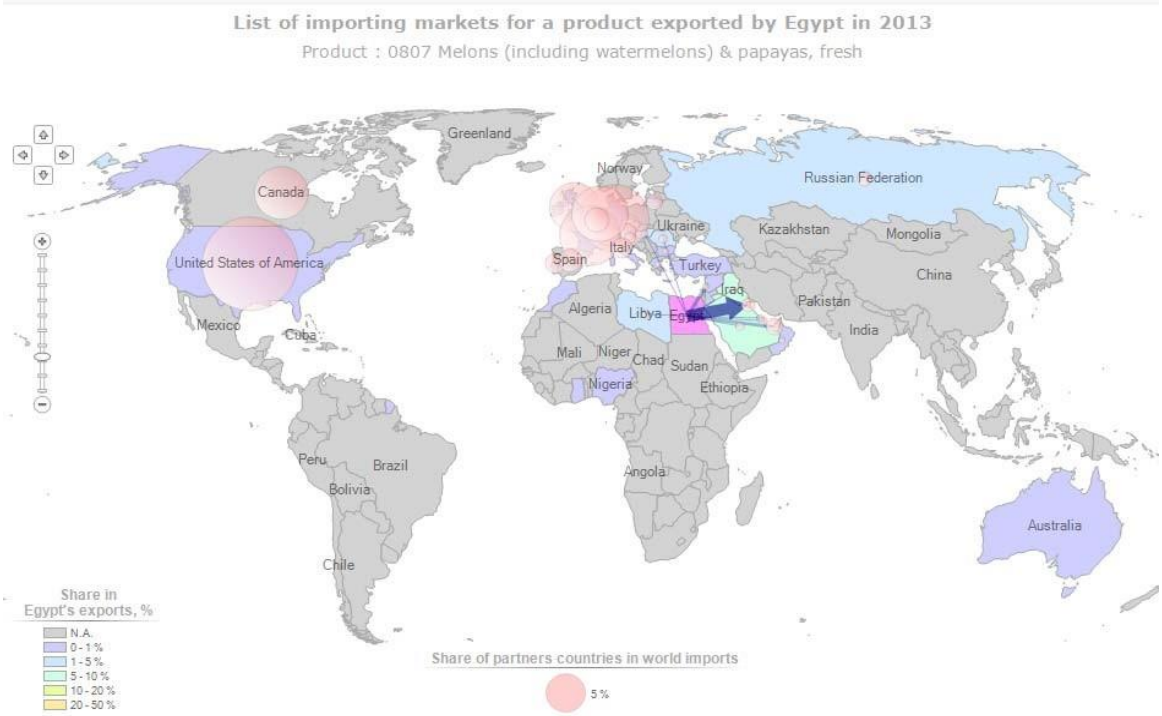


Figure 7. Egypt Musk Melons Geographic Focus

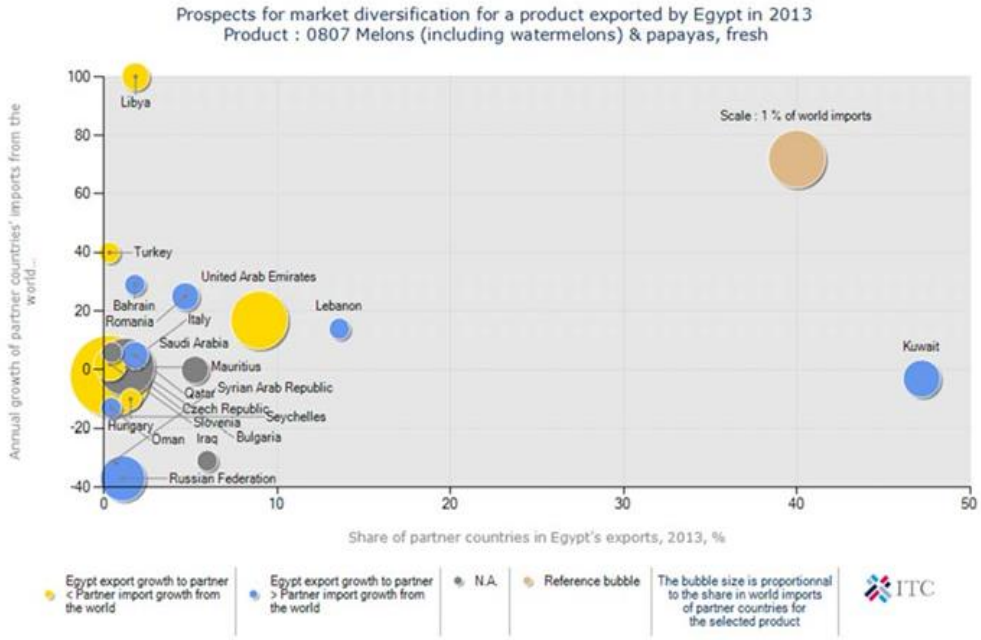


Figure 8. Egypt Musk Melons Market Diversification Prospects

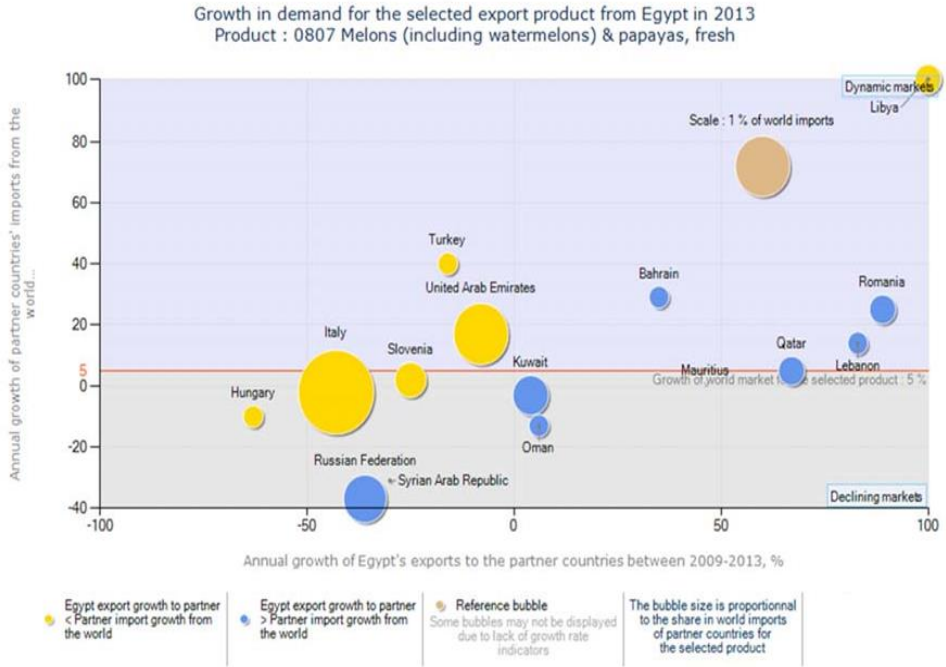


Figure 9. Egypt Musk Melons Growth in Demand

Table 3. Egypt Musk Melons Export Growth Trends, Export Quantity in Metric Ton

Importers	2009	2010	2011	2012	2013	2014
Total	1.784	1.874	1.138	1.743	2.017	820
United Kingdom	457	613	501	463	369	260
France	215	187	111	93	112	149
Italy	233	258	20	22	22	132
Switzerland	87	114	141	118	99	105
Lebanon	27	46	29	39	81	67
Mauritius	8	9	3	12	33	61
Netherlands	685	259	82	38	58	37
Singapore			4			4
Jordan						2
Germany	19	12	18	5	29	1
Luxembourg	-	-				1
Russian Federation		17		51	30	1

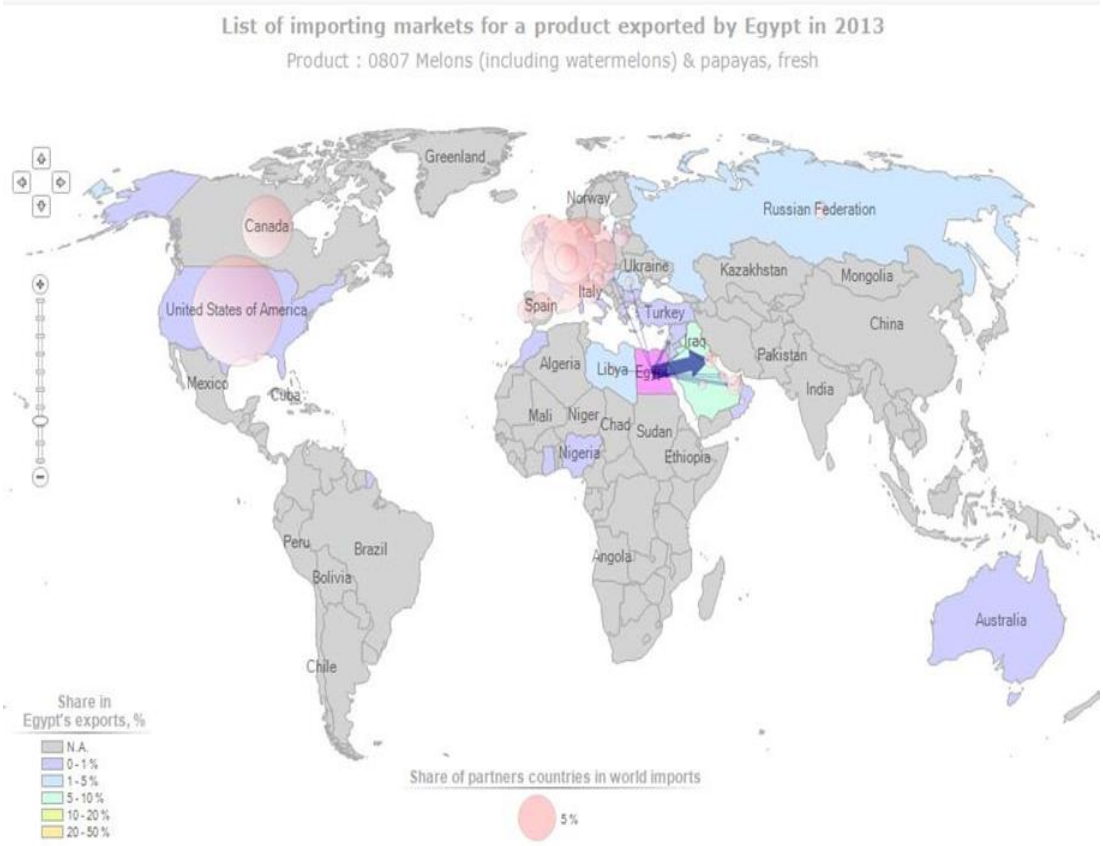


Figure 7. Egypt Musk Melons Geographic Focus

1.2. Marketing Feasibility and Marketing Projections for Strawberry

Although strawberry is highly profitable exportable crop, it is new product in the Upper Egypt. This paper promotes establishing and expanding fresh strawberry production to capture early strawberry market windows of strawberry in the EU and GCC markets.

Strawberry is a capital intensive crop and highly perishable. Therefore it is rarely grown in the target area in Upper Egypt. Therefore it might be a risky product without proper marketing arrangements. Export markets of the fresh strawberry are big and growing. Egypt gains experience exporting strawberry to various markets with specific focus on the EU, GCC, and Far-East markets. Value and volumes of Egypt's fresh strawberry export showed a double digit growth rates in the last 10 years. However, most of the strawberry exports are sourced from the Northern part of Egypt with little focus on Upper Egypt. The largest market windows for the Egyptian fresh strawberry are mainly the early production to capture the market window between Southern (off-season) and Northern (on-season) hemisphere supplies. Moderate weather condition in Upper Egypt pushes the buds to open almost two to three weeks earlier than other geographic areas in Egypt. This unique microclimate with relatively inelastic demand, lack of supplies from other sources, and consumer's year round demand pushes export prices of fresh strawberry during Upper Egypt production season high. This offers Upper Egypt strawberry farmer's excellent marketing opportunities. strawberry export from Upper Egypt is facing very little or no shadow window competition, enjoy excellent consistent growth rate for selling prices, and fits nicely the consumer consuming habits and preferences of the seedless Strawberry.

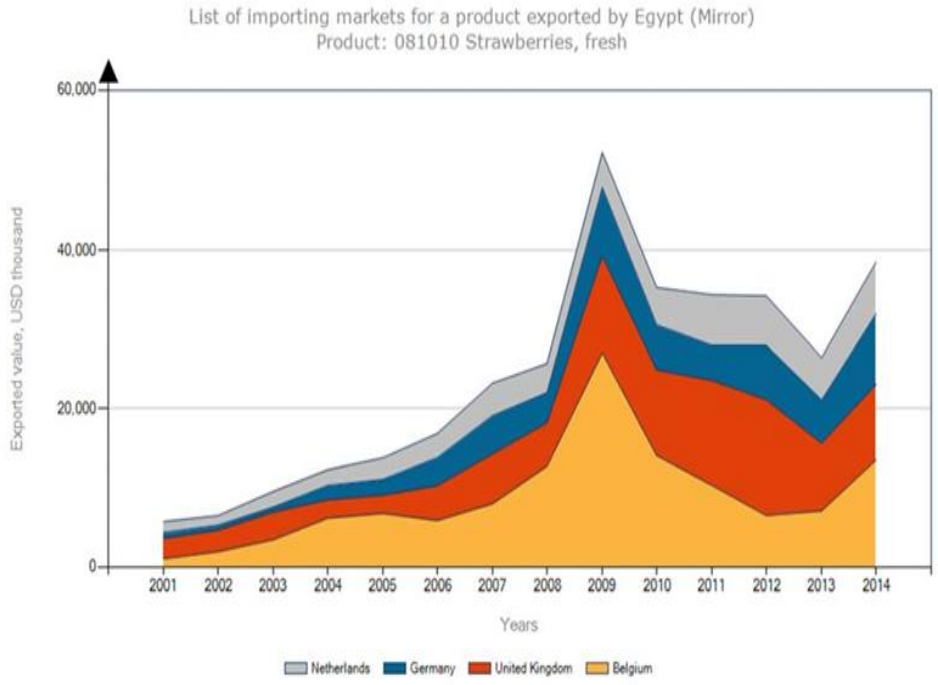


Figure 10. Egypt Fresh Strawberry Export Trend, Value US Dollar Thousand

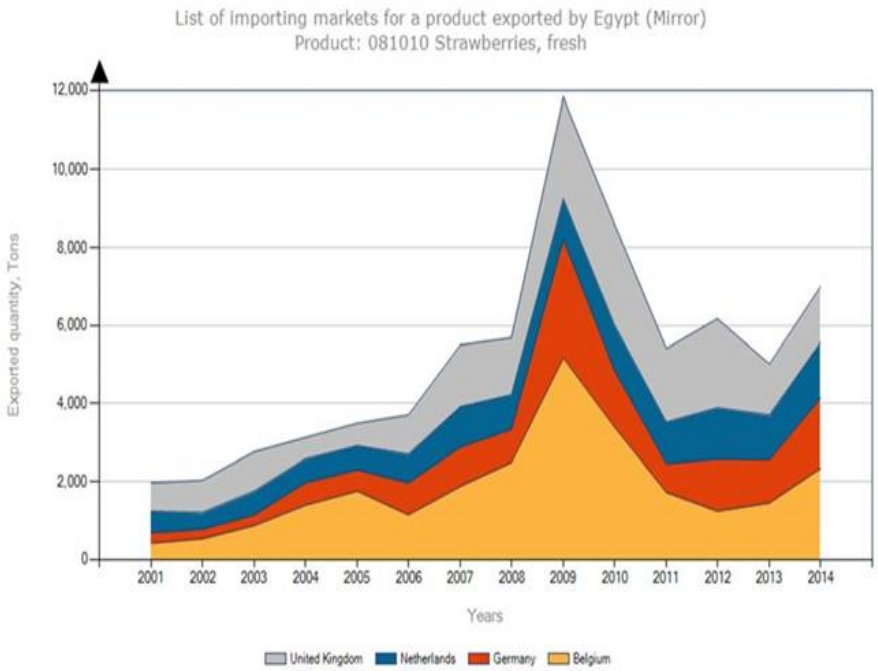


Figure 11. Egypt Fresh Strawberry Export Trend, Volume in Metric Ton

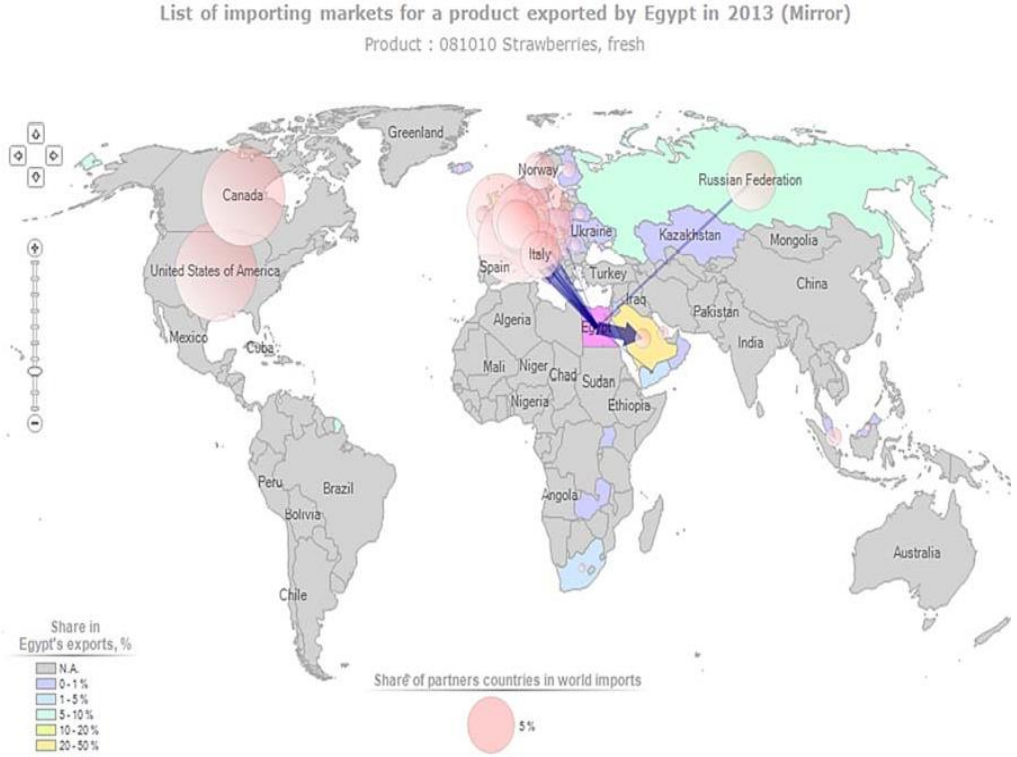


Figure 12. Egypt Fresh Strawberry Export Geographic Focus

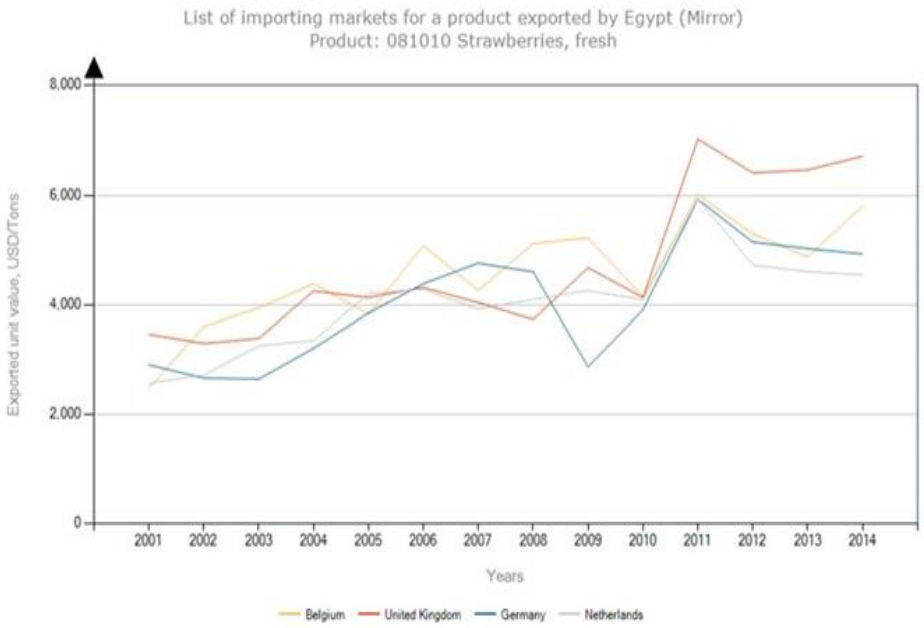


Figure 13. Egypt Fresh Strawberry Export Trend, Unit Value Us Dollar/Ton

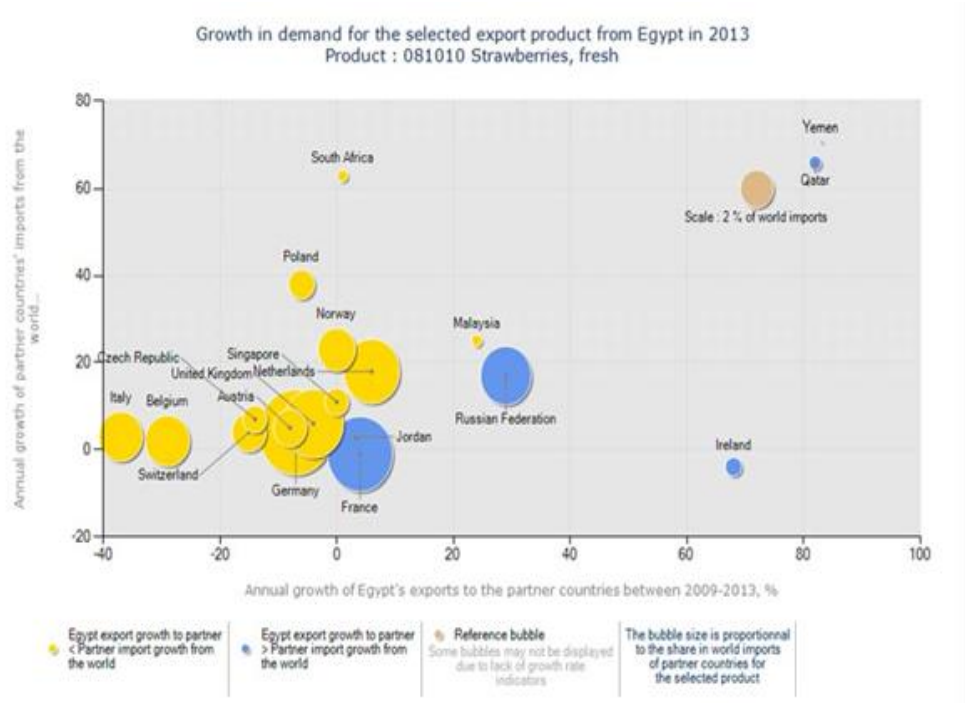


Figure 14. Growth in Demand for Egypt Fresh Strawberry

Table 4. Egypt Fresh Strawberry Export Trade Indicators, 2013

Importers	Trade Indicators							
	Exported value 2013 (USD thousand)	Share in Egypt's exports (%)	Exported quantity 2013 (Ton)	Exported growth in value between 2009-2013 (%, p.a.)	Exported growth in value between 2012-2013 (%, p.a.)	Share of partner countries in world imports (%)	Total import growth in value of partner countries between 2009-2013 (%, p.a.)	Tariff (estimated) faced by Egypt (%)
Total	59,308	100						
Saudi Arabia	15.661	26.4	7.148		-23	1		
UK	8,527	14.4	1.31	-4	-42	7.3	6	0
Belgium	7.,069	11.9	1.450	-29	8	3.9	2	12.8
France	5.570	9.4	1.037	4	52	8.8	-1	12.8
Germany	5.557	9.4	1.105	-7	-19	11.7	4	12.8
Netherlands	5.233	8.8	1.136	6	-16	6.4	18	12.8
Russian Fed.	3.703	6.2	1.097	29	26	5.1	17	12.8
Ireland	1.381	2.3	265	68	3	0.4	-4	6.2
Yemen	920	1.6	397	83	43	0	71	12.8
Norway	695	1.2	87	0	-25	2.6	23	0
South Africa	684	1.2	545	1	8	0.1	63	9.9
Czechia	571	1	105	-14	11	1	7	15
Austria	546	0.9	115	-8	51	2.1	5	12.8
Qatar	536	0.9	188	82	124	0.2	66	12.8
Jordan	508	0.9	170	3	-18	0	3	0
Singapore	408	0.7	90	0	-43	1	11	0
Switzerland	291	0.5	44	-15	-29	2.2	4	0
Poland	243	0.4	45	-6	23	1.2	38	57.9
Malaysia	228	0.4	59.0	24	-5	0.1	25	12.8

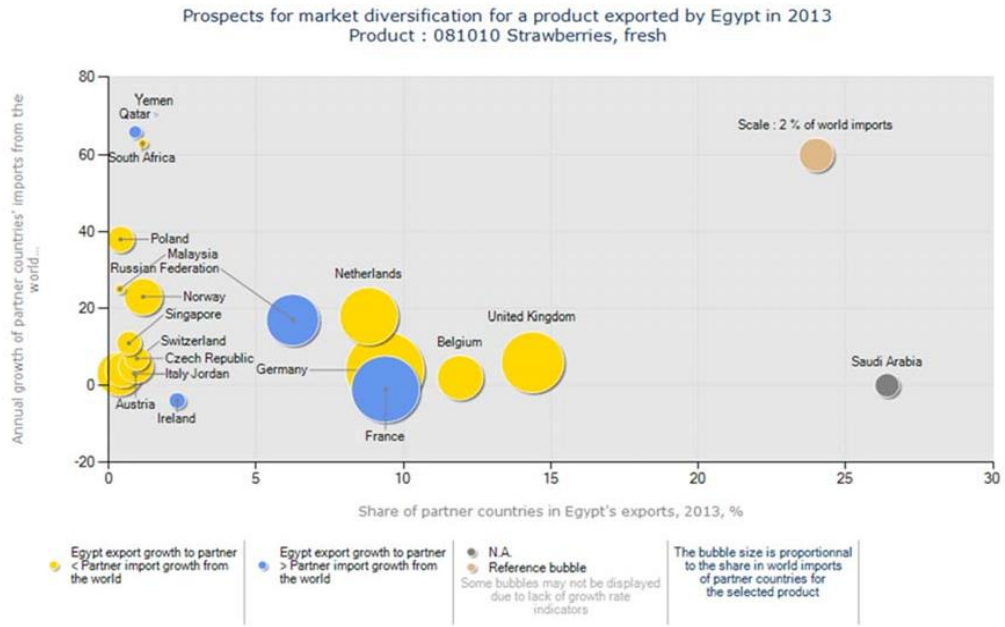


Figure 15. Egypt Fresh Strawberry Prospects for Market Diversification

2. Material and Method:

The main aim of this analysis is to assess the impact of the agricultural interventions' by applying the conservation practices on the socio-economic aspects and financial viability in the rural communities in Upper Egypt considering the value chain actors (framers, exporters, and famers' and exporters' association). The purpose of this research study is to explore the socio-economic impact of moving from traditional agricultural to conservation agriculture. CBA is used for this purpose (Molinos-Senante et al., 2014; Alvarado, 2013; Boardman, 2011 and 2018; Elias et al., 2017; Jenkins et al., 2018; Kagin et al., 2019). The CBAs can be classified as ex-ante and ex-post (retrospective) (Boardman et al., 2011; Boardman et al., 2018; Cella and Florio, 2007). The ex-ante or prospective CBA is conducted to assess the impact if we applied certain agricultural interventions that could or not generate profit (Kjerkreit and Odeck, 2009; Levy, 2004; Policy, 2008; Hayashi and Morisugi, 2000; Bristow and Nellthorp, 2000; Gómez-Lobo, 2012; Grant-Muller et al., 2001; Van Wee, 2012; Elgar, 2008). While the ex-post or retrospective CBA is estimated to examine the impact of already applied certain agricultural interventions to study if these interventions generated profit (Hunter et al., 2009; Hutton et al., 2007; Haller et al., 2007; Narrod et al., 2012; Molinos-Senate et al., 2012; Molinos-Senate et al., 2014). The CBA is estimated based on quantitative and qualitative data collected from secondary and primary sources (the USDA, COMTRADE, CAPMAS, Agriculture Quarantine, Import/Export Control Authority) and primary sources through focus groups with input suppliers, associations, growers, exporters, , famers' and exporters' association). The UNIDO Computer Model for Feasibility Analysis and Reporting (COMFAR III Expert®) has been applied to assess the financial and economic. Risk assessment using Monte Carlo simulation technique has been also conducted by using @RISK 6 Professional®. Detailed crop enterprise budgets and the macroeconomic parameters were used to construct the following working tables: inflation index; revenue prices; production and revenue; direct operational costs; working capital; and investment costs. The estimations are based on nominal and real prices with total investment point of view (nominal) and total investment point of view (real). The Egyptian Pound (EGP) is used as reference currency for calculation purposes. The social discount rate used in the analysis is 12%. The 30 days coverage (coefficient of the turnover=12) is used for the assumptions of the working capital assumptions that are for accounts receivable, inventory, cash in hand, and accounts payable. The Egyptian government offers 9% export support and 10% sales tax.

The comparisons between the agricultural interventions and without are considered in all of the estimations. The Net Present Value (NPV) is estimated for the inflow and the NPV is calculated by:

$$NPV(i,N) = \sum_{t=1}^{N} \frac{K_t}{(1+i)^t} \quad (1)$$

Where $R_{0\,is}$ the fixed investments with the interventions' life cycles, (*t*, *Rt*) is 20-year period, cash flow. Two discount rates are calculated at 12%.

according to the method that annualized effective compounded return rate and rate of return that makes the NPV positive and negative, The Internal Rate of Return (IRR) is estimated with the assumption of the 20-year period, cash flow (pairs n, C_n), the IRR is given by:

$$NPV = \sum_{i=0}^{N} \frac{C_n}{(1+r)^n} = 0 \quad (2)$$

The Foreign Exchange Premium (FEP) and the Premium for Non-Tradable Outlays (NTP) are calculated based on international trade distortions of a country, the indirect taxes, economic discount rate, and export and production subsidies. These variables are considered as the key

national parameters required for completing accurate and consistent economic analysis of investment interventions. The shadow price of foreign exchange and the FEP can be measured, If interventions are given to the tradable goods, with respecting all the economic welfare impacts that affected by the market distortions and the interaction with the changes in demands and supply demand and supply of the tradable and non-tradable goods. The impact of the economy depends on the source of the funds and the characterizations of the distortions in the markets for goods and services.

The FEP can be estimated through the net impact of the operations of two markets that can be defined as the increase of the economic value over the exchange rate of the market:

$$FEP = \omega_d * \Delta EW_{t,d} + \omega_f * \Delta EW_{t,f} \quad (3)$$

Where ω_f is the proportion of funds sourced abroad, ω_d is the proportion of funds sourced domestically, $\Delta EW_{t,d}$ is the change in sourcing funds from the domestic capital market and spending the funds on tradable that lead to economic welfare, and $\Delta EW_{t,f}$ is the change in the welfare cost that is due to the sourcing of funds from the foreign capital market and spending these funds on tradable goods.

In the case of the interventions are totally given to on non-tradable goods, the NTP can be estimated by changes in economic welfare that created as result in the shift in demand and supply between tradable and non-tradable goods and services in the presence of market distortions caused by taxes. That can be measured as follows:

$$NTP = \omega_d * \Delta EW_{nt,d} + \omega_f * \Delta EW_{nt,f} \quad (4)$$

Where $\Delta EW_{nt,d}$ is the change in combined action of sourcing of funds through the domestic capital market and spending these funds on non-tradable goods that lead to economic welfare, and $\Delta EW_{nt,f}$ is the change in economic welfare that is due to the sourcing of funds via the foreign capital market and then spending these funds on non-tradable goods.

In the case of the tradable goods demand is broken down into demand for importable and demand for exportable, (η_t^d) can then be obtained by the elasticities of the weighted average of demand for importable (η_i^d) and exportable (η_e^d) with respect to the real exchange rate. That can be expressed as:

$$\eta_t^d = \eta_i^d \theta_i^d + \eta_e^d \theta_e^d \quad (5)$$

Where θ_i^d and θ_e^d is the demand share for the importable and exportable goods and services in total tradable, respectively. Through the compensated own-price elasticity of demand for tradables (η_t^d) and the compensated cross-price elasticity of demand for non-tradables(η_{nt}^d),with respect to a change in the foreign exchange rate, the relationship is:

$$\eta_t^d = -\eta_{nt}^d (Q_{d,nt}/Q_{d,t}) \quad (6)$$

This condition provides a consistency check in the market operations.

The supply elasticity of tradable goods (ε_t^s) is estimated by the weighted average of the elasticitys' of supply of importables (ε_i^s) and exportables (ε_e^s) . That can be expressed as:

$$\varepsilon_t^s = \varepsilon_i^s \theta_i^s + \varepsilon_e^s \theta_e^s \quad (7)$$

Where θ_i^s and θ_e^s are the supply share of the importable and exportable goods in total tradable, respectively.

The relationship for the supply side can be expressed as:

$$\varepsilon_t^s = -\varepsilon_{s,nt}^s(Q_{s,nt}/Q_{s,t}) \quad (8)$$

These substitution impacts on the welfare costs can be estimated by the net impact on domestic indirect taxes and export and /or production subsidies associated with the change in quantities of the demand and supply of the tradable and non-tradable goods and services.

The relationship between the Official Exchange Rate (OER), the Foreign Exchange Premium (FX *premium*), the Shadow Exchange Rate (SER), and the Standard Conversion Factor (SCF) is estimated as follows:

$$SER = OER(1 + FX\ Premium) \quad (9)$$

$$SCF = \frac{1}{1+FX\ Premium} \quad (10)$$

$$SER = \frac{OER}{SCF}\ and\ \frac{OER}{SER} \quad (11)$$

3. Results and Discussion:

Real economic flows are computed by adjusting the financial cash flows from the total investment point of view using appropriate conversion factors. Total cash inflow is calculated by net sales, change in account receivable and salvage value. In cash outflow includes land, irrigation, and trellises systems investment cost and all operational cost land preparation, planting materials, fertilizer, pesticides, fuel and lubricants, packaging materials, other operational costs, and cost of labor. The Economic resource flow has been obtained by multiplying the line items of EGP (Real) by respective conversion factors.

Total cash inflow is calculated by net sales, change in account receivable and salvage value. In cash outflow includes land, irrigation, and trellises systems investment cost and all operational cost land preparation, planting materials, fertilizer, pesticides, fuel and lubricants, packaging materials, other operational costs, and cost of labor. The Economic resource flow has been obtained by multiplying the line items of EGP (Real) by respective conversion factors.

Results of the financial analysis are summarized in the following paragraphs. On a per-Feddan basis, focusing on improving value chain actors decision making and enhance the exportability and logistics, one Feddan yields a NPV of EGP 65,255 (IRR 48 %) over the 20-year period, as compared to EGP 952 for traditional marketing systems. If traditional practices continue, each farmer earns an incremental benefit of EGP 952 but this amount increases to EGP 64,303 if the agricultural interventions effectively implemented.

For one Feddan, the NPV for fresh Musk Melons s value chain works out to EGP (916) without the interventions (IRR 11 %). Growers are losing money by growing musk melons without interventions. Results of the financial analysis are summarized in the following table. For the total production target area, focusing on improving value chain actors decision making and enhance the exportability and logistics, the target area yields a NPV of EGP 36,250,403 (IRR 71 %) over the 20-year period, as compared to EGP (326,845) for traditional marketing systems. If traditional practices continue, each farmer lose an incremental benefit of EGP (916) but this amount increases to EGP 71,136 if the interventions effectively implemented.

The NPV for fresh strawberry value chain (For one Feddan) works out to EGP 4,537 without the interventions (IRR 16%). Growers are hardly making any financial benefits from investing in this product without interventions. For the total production area, focusing on introducing strawberry and improving value chain actors decision making and enhance the

exportability and logistics, a NPV of EGP 42,706,380 (IRR 91%) over the 20-year period, as compared to EGP 4,537 for traditional marketing systems. If traditional practices continue, each farmer earns an incremental benefit of EGP 116,191 if the interventions effectively implemented.

For the total target area the FNPV the equity capital is calculated at EGP 339,803 without interventions. With interventions the FNPV increases to 3339,803. This yields an incremental value of FNPV 30,554,433

The results from estimating the NPVs are always positive values up to a discount rate of 52%, 58%, and 75% for the green onion, musk melons, and fresh strawberry, respectively. The payback period @ 12 % discount rate is 3.53, 3.31, and 2.96 years for the green onion, musk melons, and fresh strawberry, respectively. The employment impact of the interventions revealed a real FNPV of EGP 13,770, 6,212, and 11,054 for unskilled labor and EGP 7,925, 11,016, and 48,222 for the skilled labor with a total impact of real EGP 21,695, 17,228, and 59,276 for the green onion, musk melons, and fresh strawberry, respectively.

Fresh Green Onions value chain NPV (Economic) at the economic rate of discount of 12 % works out to EGP 32,436,598. **The Net Resource Flow of Externalities (**ENPV) (EGP 166,655,559) is higher than the FNPV (EGP 152,495,283), fresh table for export value chain is creating economic externalities of real ENPV of 2,207,246. Fresh Musk Melons value chain NPV (Economic) at the economic rate of discount of 12 % works out to EGP 40,195,463. As the ENPV (EGP 40,195,463) is higher than the FNPV (EGP 36,250,403), Musk Melons for export value chain is creating economic externalities of real NPV of 3,207,709. Fresh Strawberry value chain NPV (Economic) at the economic rate of discount of 12 % works out to EGP 44,870,084. As the ENPV (EGP 44,870,084) is higher than the FNPV (EGP 40,195,463), fresh strawberry for export value chain is creating economic externalities of real NPV of 3,276,224. The total incremental economic benefit generated per upstream value chain actors obtaining marketing and logistical assistance is EGP 2,207,246. Growers and laborers share of the incremental ENPV is 1,876,159, Input suppliers real ENPV EGP 220,725, and the government share is real ENPV EGP 110,362.

The probability of Negative EIRR and negative NPV is zero % for the targeted value chains. The targeted value chains (green onion, musk melons, and fresh strawberry) enjoy minimal risk for the growers in the target in Upper Egypt.

Table 5.Green Onions Financial NPY And IRR, (12 % Discount Rate, 20-Years)

	Traditional marketing (EGP)	Export oriented production (EGP)
Financial NPV per Feddan	952	65,255
Incremental Financial NPV		64,303
Financial IRR	13 %	149 %

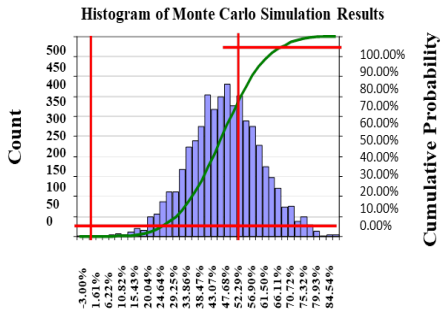
Table 6.Musk Melons Financial NPY and IRR, (12 % Discount Rate, 20-Years)

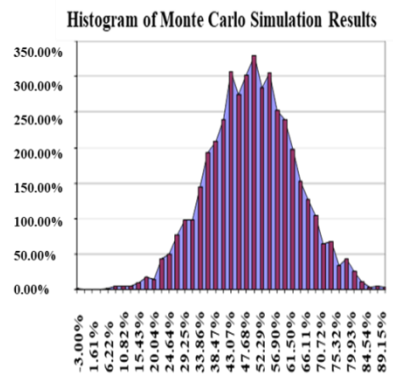
	Traditional marketing (EGP)	Export oriented production (EGP)
Financial NPV per Feddan	(916)	71,136
Incremental Financial NPV		57,694
Financial IRR	11 %	59 %

Table 7.Strawberry Financial NPY and IRR, (12 % Discount Rate, 20-Years)

	Traditional marketing (EGP)	Export oriented production (EGP)
Financial NPV per Feddan	4,537	93,320
Incremental Financial NPV		71,254
Financial IRR	16 %	81 %

Table 8. Green Onions Value Chain Risk Analysis

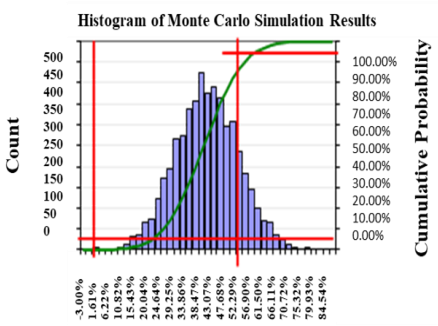




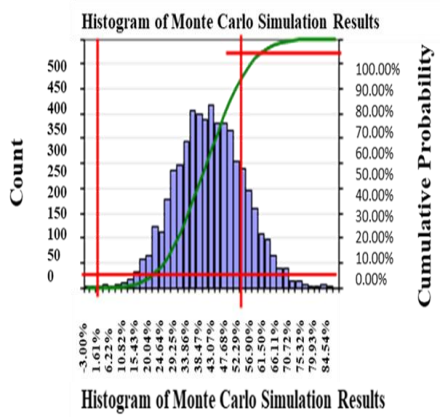
Simulation	Histogram Plot				Summary Statistics			
37.18%	Min		3.00%		Sample	5000		
8.37%	Max		89.15%		Central Tendancy (Location)			
42.62%	N		5000		Mean	48.14%	Median	48.20%
44.63%					StErr	0.18%		
47.82%	Bins	Count	Scaled	Total	Spread			
48.69%	-3.00%	1	0.87%	0.02%	StDev	12.88%	Range	92.14%
62.70%	-0.70%	0	0.00%	0.02%	Q(.25)	39.60%	Q(.75)	56.76%
50.72%	1.61%	0	0.00%	0.02%	IQ Range	17.16%		
57.67%	3.91%	0	0.00%	0.02%	Shape			
41.84%	6.22%	2	1.74%	0.06%	Skewness	-2.37%	Kurtosis	-0.31%
45.69%	8.52%	5	4.34%	0.16%	Quantiles, Percentiles, Intervals			
56.13%	13.13%	5	4.34%	0.38%	90% Interval		95% Interval	
27.42%	15.43%	11	9.55%	0.60%	Q(.05)	26.75%	Q(.025)	22.78%
45.68%	17.73%	20	17.36%	1.00%	Q(.95)	69.63%	Q(.975)	74.33%
47.16%	20.04%	16	13.89%	1.32%	Alpha (a)	5.00%	Q(a/2)	22.78%
58.51%	22.34%	50	43.41%	2.32%	%Interval	95.00%	Q(1-a/2)	74.33%
40.86%	24.64%	57	49.49%	3.46%	Probabilities			
60.07%	26.95%	88	76.40%	5.22%	***Pr(IIR > 0)***		*100%*	
56.27%	29.25%	113	98.11%	7.48%	***Pr(EIRR < 22.00%)***		*2.15%*	
49.95%	31.56%	112	97.24%	9.72%	**Pr(EIRR > 74.00%)**		2.64%	
37.08%	33.86%	167	144.99%	13.06%	**Pr(EIRR)**		95.21%	
45.87%	36.16%	223	193.61%	17.52%	**Alpha (a)**		4.79%	
42.05%	38.47%	240	208.37%	22.32%	**EIRR**			
71.75%	40.77%	276	239.62%	27.84%	**Parameter**		**Value**	
27.70%	43.07%	354	307.34%	34.92%	μ_{EIRR}		48.00%	
45.25%	45.38%	317	275.22%	41.26%	σ_{EIRR}		13.00%	
41.58%	47.68%	349	303.00%	48.24%				

	53.17%	49.98%	380	329.92%	55.84%	

Table 9. Musk Melons Value Chain Risk Analysis



Simulation	Histogram Plot		Summary Statistics		Simulation			
136.25%	Min		-23.54%		Sample	5000		
83.51%	Max		169.34%		Central Tendancy (Location)			
108.14%	N		5000		Mean	69.85%	Median	69.56%
59.05%					69.15%	0.34%		
102.71%	Bins	Count	Scaled	Total	Spread			
41.81%	-23.54%	1	0.41%	0.02%	StDev	24.25%	Range	192.88%
36.29%	-18.72%	1	0.41%	0.04%	Q(.25)	53.57%	Q(.75)	86.28%
77.34%	-13.89%	4	1.66%	0.12%	IQ Range	32.71%		
88.12%	-9.07%	1	0.41%	0.14%	Shape			
82.66%	5.39%	4	1.66%	0.26%	Skewness	-0.77%	Kurtosis	1.51%
112.40%	10.22%	13	5.39%	0.52%	Quantiles, Percentiles, Intervals			
22.75%	15.04%	32	13.27%	1.16%	90% Interval		95% Interval	
89.87%	19.86%	33	13.69%	1.82%	Q(.05)	30.49%	Q(.025)	22.92%
69.95%	24.68%	65	26.96%	3.12%	Q(.95)	110.05%	Q(.975)	117.71%
40.46%	29.00%	73	30.28%	4.58%	Alpha (a)	5.00%	Q(a/2)	22.92%
114.44%	34.33%	122	50.60%	7.02%	%Interval	95.00%	Q(1-a/2)	117.71%
41.58%	39.15%	172	71.34%	10.46%	Probabilities			
67.76%	43.97%	196	81.29%	14.38%	***Pr(IIR > 0)***		*100%*	
88.06%	48.79%	264	109.50%	19.66%	***Pr(EIRR < 22.00%)***		*2.37%*	
38.23%	53.61%	273	113.23%	25.12%	**Pr(EIRR > 118.00%)**		2.37%	
85.36%	58.44%	338	140.19%	31.88%	**Pr(EIRR)**		95.26%	
101.22%	63.26%	357	148.07%	39.02%	**Alpha (a)**		4.74%	
80.03%	68.08%	426	176.69%	47.54%	**EIRR**			
70.28%	72.90%	376	155.95%	55.06%	**Parameter**		**Value**	
100.64%	77.72%	389	161.34%	62.84%	μ_{EIRR}		70.00%	
49.55%	82.55%	365	151.39%	70.14%	σ_{EIRR}		24.00%	
105.53%	87.37%	297	123.18%	76.08%				
72.79%	92.19%	307	127.33%	82.22%				



Simulation	Histogram Plot				Summary Statistics			
61.33%	Min		-11.45%		Sample	5000		
55.86%	Max		164.51%		Central Tendancy (Location)			
108.14%	N		5000		Mean	73.31%	Median	72.92%
59.05%					69.15%	0.34%		
102.71%	Bins	Count	Scaled	Total	Spread			
17.36%	19.34%	19	8.64%	0.94%	StDev	23.87%	Range	175.96%
80.99%	23.74%	31	14.09%	1.56%	Q(.25)	57.07%	Q(.75)	89.46%
54.07%	28.14%	58	26.37%	2.72%	IQ Range	32.39%		
36.51%	32.54%	66	30.01%	4.04%	Shape			
93.65%	36.94%	120	54.56%	6.44%	Skewness	6.80%	Kurtosis	-3.91%
58.37%	41.33%	111	50.46%	8.66%	Quantiles, Percentiles, Intervals			
57.12%	45.73%	176	80.02%	12.18%	90% Interval		95% Interval	
70.05%	50.13%	236	107.29%	16.90%	Q(.05)	30.57%	Q(.025)	27.42%
36.21%	54.53%	246	111.84%	21.82%	Q(.95)	112.79%	Q(.975)	120.07%
64.40%	58.93%	293	133.21%	27.68%	Alpha (a)	5.00%	Q(a/2)	27.42%
64.26%	63.33%	355	161.40%	34.78%	%Interval	95.00%	Q(1-a/2)	120.07%
57.03%	67.73%	349	158.67%	41.76%	Probabilities			
102.61%	72.13%	337	153.21%	48.50%	***Pr(IIR > 0)***		*100%*	
114.71%	76.53%	367	166.85%	55.84%	***Pr(EIRR < 25.00%)***		*1.89%*	
80.35%	80.93%	331	150.49%	62.46%	**Pr(EIRR > 121.00%)**		2.30%	
113.93%	85.33%	329	149.58%	69.04%	**Pr(EIRR)**		95.81%	
94.85%	89.72%	315	143.21%	75.34%	**Alpha (a)**		4.19%	
80.15%	94.12%	253	115.02%	80.40%	**EIRR**			
100.71%	98.52%	237	107.75%	85.14%	**Parameter**		**Value**	
51.10%	102.92%	195	88.65%	89.04%	μ_{EIRR}		73.00%	
96.74%	107.32%	158	71.83%	92.20%	σ_{EIRR}		24.00%	
26.08%	111.72%	108	49.10%	94.36%				
95.81%	116.12%	97	44.10%	96.30%				

Table 10. Fresh Strawberry Risk Analyses

Sensitivity Analysis is applied (Tables 8, 9, and 10)to assess the Risk Variables that are considered the Real Increase and/or Decrease in the Farm Gate and FOB Prices, Real Increase and/or Decrease in Direct Operational Cost, Increase/Decrease in Total and Exportable yield. A range of change between -20 and + 20 with step 5 % is estimated.

If there is real increase in selling price, the NPV and IRR will be affected positively. If the selling price increases by 5 % there will be increase in NPV by 56%, 71%, and 53% for increase in price of fresh the green onion, musk melons, and fresh strawberry, respectively.

While if there is real decrease in selling price by 5 %, the NPV would decrease 46%, 42%, and 42% for the green onion, musk melons, and fresh strawberry, respectively. In the case of there is real increase in direct operational cost like fertilizer, seeds, fuel, pesticides, laborer etc., then if the increase is 5 %, the NPV will decrease by 44%, 42%, and 41% for the green onion, musk melons, and fresh strawberry, respectively. And if the exportable yield increased (ratio of exportable quality product to total yield/Feddan), the NPV will increase by 43%, and 56% for the green onion, musk melons, and fresh strawberry, respectively.

Risk Analysis was conducted using @RISK professional 6 software. 5,000 simulation was running. Following assumptions were taken: standard normal distribution with parameters μ = 48 % and σ = 13 % for green onion, while μ = 70 % and σ = 24 % for the musk melons, and μ = 73 % and σ = 24 % for fresh strawberry (μ is calculated based on the sensitivity analysis results, and σ is the mean value of minimum, as well as the maximum scenarios).

Results implying that the Mean value of EIRR (μ_{EIRR}) is 48%, 126% and 73%, the Standard deviation σ_{EIRR} 13%, 25%, and 24% for the green onion, musk melons, and fresh strawberry, respectively.

4. Concluding Remarks and Policy Recommendations

This study assessing the socio-economic potential of converting the existing traditional practices of farming to modern and conservative agricultural with considering the marketing intelligence and logistics. That will improve the smallholder farmers' livelihoods and increase their income. The agricultural interventions proposed are applied to increase the horticultural productivity and enhance the quality to meet the international standards. The marketing viability of export markets of the selected value chains is growing, where Egypt has good experience exporting fresh foods to various markets with a specific focus on the EU, GCC, and Far-East markets. Improving the quality of the production could increase the quantity volume and value of the exported fresh foods. Nevertheless, most of the exported quantity are sourced from the Northern part of Egypt with little focus on Upper Egypt.

This paper evaluates the socio-economic impact of agricultural interventions on rural communities in Upper Egypt. This inclusive value chain approach will generate high positive socio-economic benefits for the smallholder farmers and other relevant stakeholders, as well as rural society. The moderate weather condition in Upper Egypt enables almost two to three weeks earlier than other geographic areas in Egypt, this offers Upper Egypt fresh produce farmer’s excellent marketing opportunities.

The socio-economic benefits of the intervention in the green onion, musk melon, and fresh strawberry were subject to sensitivity analysis assuming +20 in operational costs, real prices, and investment cost. The EIRR range of change is 30% to 60%. We can absorb a relatively wide range of changes without affecting its financial or economic viability. The results from

estimating the risk analysis using Monte Carlo simulation technique implying that the probability of negative outcomes (EIRR, ENPV) of the interventions is almost zero. In addition, the employment impact revealed a real incremental employment opportunities on the farming level.

Acknowledgments

This analysis was completed through the financial support of USAID through their "The Advanced Marketing and Agribusiness Logistics project (AMAL)", and its contract with the Horticultural Export Improvement Association (HEIA).

Disclaimer

The contents of this report are the sole responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government.

References

ACDI-VOCA AMAL, (2015). Farm Budget Data for Selected Value Chains (Focus Group Surveys 2015).

Boardman, A., Greenberg, D., Vining, A., & Weimer, D. (2011). Cost-Benefit Analysis: Concepts and Practice. 4th Edition. 541 pages. Prentice Hall publishers. New York.

Boardman, A., Greenberg, D., Vining, A., & Weimer D. (2018). Cost-Benefit Analysis: Concepts and Practice. 5th Edition. 541 pages. Prentice Hall publishers. New York.

Bristow, A. L. & Nellthorp, J. (2000). Transport project appraisal in the European Union. *Transport policy*, 7(1), 51-60.

Cella, M., &Florio, M. (2007). Hierarchical contracting in grant decisions: ex-ante and ex post evaluation in the context of the EU Structural Funds. Working paper 22. *University of Milan.* Research Papers in Economics, Business and Statistics.

Egypt CAPMAS, (2011) - Household Income, Expenditure, and Consumption Survey, *HIECS 2010/2011*.

Elgar, E., (2008). Decision-Making on Mega-Projects.

European Commission, 2005. Ex Post evaluation of a sample of projects co-financed by the Cohesion Fund (1993-2002). *DG Regional Policy.*

European Commission, (2006). Working document no. 4. Guidance on the methodology for carrying out Cost-benefit analysis. *DG Regional Policy.*

European Commission, (2008). Guide to Cost Benefit Analysis of Investment Projects. Brussels: Directorate General Regional Policy. *European Commission.*

European Commission, (2010). Ex post evaluation of cohesion policy interventions 2000-2006 financed by the Cohesion Fund including former ISPA – Work Package B. Cost benefit analysis of selected transport projects. *DG Regional Policy*.

European Commission, (2010). Ex post evaluation of cohesion policy interventions 2000-2006 financed by the Cohesion Fund including former ISPA – Work Package C. Cost benefit analysis of environmental projects. *DG Regional Policy*.

European Commission, (2012). Ex post evaluation of investment projects co-financed by the European Fund for Regional Development (ERDF) and Cohesion Fund (CF) in the period 1994-1999. *DG Regional Policy.*

European Commission, (2012). Ex post evaluation of the Cohesion Fund including former ISPA in the 2000-2006 period– Synthesis report. DG Regional Policy.

Florio, M. (2007). Introduction: multi-government cost-benefit analysis, shadow prices and incentives. Cost-Benefit Analysis and Incentives in Evaluation. *The Structural Funds of the European Union.*

Florio, M., &Vignetti, S. (2013). The Use of Ex Post Cost-Benefit Analysis to Assess the Long Term Effects of Major Infrastructure Projects (May 22, 2013). Available at SSRN: https://ssrn.com/abstract=2723381 or http://dx.doi.org/10.2139/ssrn.2723381

Gómez-Lobo, A. (2012). Institutional Safeguards for Cost Benefit Analysis: Lessons from the Chilean National Investment System. *Journal of Benefit-Cost Analysis*. Vol. 3: Iss. 1. Article 1.

Grant-Muller, S. M., Mackie, P., Nellthorp, J., & Pearman, A., (2001). Economic appraisal of European transport projects: the state-of-the-art revisited. *Transport Reviews*, 21(2), 237-261.

Haller, L., Hutton, G., & Bartram, J. (2007). Estimating the costs and health benefits of water and sanitation improvements at global level. *Journal of Water and Health* 5(4), 467–480.

Hayashi, Y., & Morisugi, H. (2000). International comparison of background concept and methodology of transportation project appraisal. *Transport policy*, 7(1), 73-88.

Hunter, R.P., Pond, K., Jagals, P., & Cameron, J. (2009). An assessment of the costs and benefits of interventions aimed at improving rural community water supplies in developed countries. *Science of the Total Environment* 407, 3681–3685.

Hutton, G., Haller, L., Bartram, J. (2007). Global cost–benefit analysis of water supply and sanitation interventions. *Journal of Water and Health* 5(4), 481–501.

IMF Statistics Department, GOVERNMENT FINANCE STATISTICS YEARBOOK

Jenkins, G. Kuo, C.Y., and Harberger, A. (2011). Cost-Benefit Analysis for Investment Decision, Queen's University, August 2012 edition.

Jenkins, G.P., Miklyaev, M., Basikiti, P.V., & Preotle, E. (2018). Cost Benefit Analysis of Agricultural Interventions to Enhance the Production of Cowpea, Groundnuts, Maize and Soybeans Value Chains in Nigeria. *Development Discussion Papers 2018-03.* JDI Executive Programs.

Kagin J., Taylor, J.E., Pellerano, L., Daidone, S., Juergens, F., Pace, N., & Knowles, M. (2019). Local Economy Impacts and Cost-Benefit Analysis of Social Protection and Agricultural Interventions in Malawi. *FAO, ILO, UNICEF.* https://www.ilo.org/wcmsp5/groups/public/---africa/---ro-abidjan/---ilo-lusaka/documents/publication/wcms_629575.pdf

Kuo, G. (2011). Estimates of the Foreign Exchange Premium and the Premium for Non-Tradable Outlays for Countries in Africa.

Levy, R. (2004). Ex Ante evaluation: a practical guide for preparing proposals for expenditure programmes. *International journal of public sector management.*

Molinos-Senante, M., Garrido-Baserba, M., Reif, R., Hernández-Sancho, F., & Poch, M., (2012). Assessment of wastewater treatment plant design for small communities: environmental and economic aspects. *Science of the Total Environment* 427–428, 11–18.

Molinos-Senante M., Perez Carrera A., Hernández-Sancho F., Fernández-Cirelli A., & Sala Garrido R. (2014). Economic feasibility study for improving drinking water quality: a case study of arsenic contamination in rural Argentina. *Ecohealth*, 2014 Dec; 11(4):476-490. DOI: 10.1007/s10393-014-0948-5.

Narrod, C., Zinsstag, J., & Tiongco, M. (2012). A one health framework for estimating the economic costs of zoonotic diseases on society. *EcoHealth*, 9, 150–162.

Policy, U., (2008). Guide to cost-benefit analysis of investment projects. *The EU. Investopedia.* Ex-Ante. http://bit.ly/2iSaJN2.

Start-EGY, (2015). Egypt's Five Year Macroeconomic Framework and Strategy - Egypt *Economic Development Conference 13-15 March 2015 SHARM EL-SHEIKH*

Taylor, B., & de Loë, R.C. (2012). Conceptualizations of local knowledge in collaborative environmental governance. *Geoforum*, 43, 1207-1217.

United Nations Commodity Trade Statistics Database, http://comtrade.un.org/db/

USAID/INDIA, (2015). REFORM PROJECT, COMPENDIUM WITH PRACTITIONERS' GUIDE, Volume V, State Fiscal Management Reform

USDA, (2015). Agricultural Marketing Services, International Wholesale Market Price Reports (New Covent Garden, United Kingdom, Paris (Rungis), *France, Rotterdam, the Netherlands).*

Van Wee, B. (2012). How suitable is CBA for the ex-ante evaluation of transport projects and policies? A discussion from the perspective of ethics. *Transport Policy*, 19(1), 1-7.