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Green Economy as a Remedy for Damages caused by Drought and Current Crisis' adverse effects on Syria's Agriculture and Agricultural Trade

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Executive Summary

The world and the Middle East in general, including Syria, has been suffering from a longstanding drought, which affected the region for several decades. During the first decade of current century, the region was hit by a severe wave of drought in 2007 and 2008, which resulted in extremely negative consequences on agriculture and agricultural trade, as well as rural population livelihood in that period. Identically, a new idea, namely "green economy" was gradually shaped at the ends of last century and the beginnings of current one. The idea implies "greening" the economy; i.e. looking at the economy basically from an environmental point of view. The idea was introduced as a panacea that tackles the problems resulted from climate changes and their adverse impacts on the earth in general, while maintaining and conserving available natural resources ─ the core part of "sustainable development" concept that the UN has been calling for.

On the local level, the country has been suffering – just like other countries in the Middle East– from desertification and drought, resulting from global climate changes and earth heating in last century. On the other hand, Syria has been practicing over-exploitation of endowed natural resources due to population increase and resources' limitation at the same time. Yet, what exaggerated the problem and made it worse was the current crisis and the war imposed on Syria, accompanied with the unjustified and rigid sanctions, which doubled the negative effects on agricultural sector as well as other production sectors and caused levels of agricultural production and trade to fall significantly, particularly during the early years of the crisis.

Concerning current study, it presents the "green economy" concept as a strategic solution that can tackle negative effects of climate change and contribute considerably to stop desertification and resource depletion. Furthermore, the study presumes that green economy can partially tackle the harmful effects of current crisis on agriculture and agricultural trade. The study's assumptions are based on several successful experiments in a number of countries, particularly some African

countries which could, by applying the principles of green economy (even partially), achieve promising environmental and developmental results[1].

The study consists of theoretical chapter that presents an introduction, followed by a historical brief about development of green economy concept, its various definitions, how to apply it, how to achieve its goals, what are the potential threats and difficulties, what are the general policies of green economy, and a description of the "green" situation in Syria. The second chapter of the study is the analytical part, where five governorates (Rural Damascus, Al Qunaytirah, Hama, Tartous and Latakia) were chosen and random samples of their farmers were selected and provided with questionnaires that cover most of the variables required for the model developed in the study. The total number of distributed questionnaires was 112, covering 1713 observations. Furthermore, data for other variables were obtained from secondary sources. Total Factor Productivity (TFP) was chosen to represent agricultural productivity, assuming that green economy significantly raises levels of agricultural productivity. A non-linear model was developed (logistic regression type) in order to examine the relations between TFP on the one hand and main variables supposed to be influencing it on the other hand, including family characteristics, land tenure type, crisis variables, environment variables, green economy variables, soil characteristics and fertilizers variables.

Logistic regression model belongs to a class of models called "limited dependent variable", wherein dependent variable is limited to maximum/minimum range, such as the range from zero to one if it is about probability, or limited to positive values in case it is about productivity (which is the case in this study). Moreover, logistic regression model is distinguished by dropping a number of general assumptions that linear regression based on classical OLS (logarithmic) model take into consideration, particularly those related to linearity and homoskedasticity, among others. In addition, logistic regression is distinguished by its ability to deal with all types of relations between dependent variable and independent variables. The model was developed by the statistician David Cox in 1958.

[1] For example, check out Nigeria's experiment in (Nwaiwu, Asiabaka, & Ohajianya, 2015).

The results revealed that family characteristics' variables (age of head of household and number of family members) are insignificant to TFP, as well as land size. Nevertheless, when crops were dealt with individually, it was found that land size matters in case of some crops. Identically, farmer personality has clear significant impact. Time, nevertheless, has significant but negative impact due to years' succession in current crisis. On the other hand, the impact of location (governorate) is moderately significant.

Concerning current crisis variables, it was found, surprisingly, that the presence of terrorist groups near surveyed regions has no impact on TFP, likely because the regions visited by NAPC staff were solely safe, and farmers could do their production activities in these regions even if armed groups were not far from the location. However, when crops were analyzed separately, it was found that the presence of terrorist groups near the region has moderately-significant negative impact on wheat production. On the other hand, "safe roads" variable has high significant impact on TFP; i.e. roads' safety largely influences production activities. This relates to the ability to deliver inputs, and their transportation costs, as well as farmer's ability to market and sell his/her production (thus achieving higher prices).

Regarding environment variables, the results indicated that the length of period separating two droughts in row has no significant impact on TFP; this is because the country and the region in general have been suffering from a longstanding drought, which influenced the significance of the examined factor and put it aside from other factors that can interpret TFP. Yet, the rainfall, as expected, enjoys positive and highly-significant impact on TFP, which underlines its importance even in case of irrigated farming.

In terms of green economy variables, the results revealed that "collecting and utilizing crop residues" has significant and positive impact on productivity of summer vegetables and wheat and barley, whereas "productivity of one cubic meter of water" has no significant impact on TFP in general, likely due to the fact that water is principally a free resource, and it has been used unreasonably in some circumstances yet with no adverse effects on productivity (i.e. production volume remained as it is and no additional costs were incurred). Nevertheless, when crops were analyzed, each individually, a highly-significant impact for this factor on each of the three field

crops (wheat, barley and tobacco) was identified, and a moderately-significant impact on apple was recorded. In this sense, it should be noted that wheat and barley are grown in relatively dry regions, which increases productivity elasticity of water; this not the case in coastal regions where water is abundant but wheat and barley are not grown there. Tobacco, in turn, is not irrigated by flooding, even though it is grown in coastal regions. Apple, however, is grown in different governorates, which probably could be the reason behind the moderately-significant effect of the factor. On the other hand, green investment was found to have no significant impact on TFP due to the fact that there is no real "green investment" in Syria in the conceptual and technical sense; nonetheless, there are agricultural investments, which may not necessarily be reflected on the chain of agricultural production, thus making the effect of green investment on TFP insignificant.

Dealing with soil variables, it was found that soil color has no significant impact on productivity, soil texture is the same; however, soil fertility was found to have highly-significant positive effect, which is reasonable result considering that fertile soil is expected to yield more than infertile ones. Soil depth, however, was found to have moderately-significant effect, while no significant impact was found for land slope on TFP. Lastly, speaking about fertilizers variables, different results were found across plants. In this respect, mineral fertilizers were found to have high significant impact on apple trees' productivity, whereas organic fertilizers were found to have high significant impact on olive trees productivity; this is not the case if other plants were considered, where a relation between their productivity and the amount of fertilizers added to them couldn't be confirmed, either because fertilizers were not added at all (zero fertilizers), or because they were added slightly or insufficiently so their impact on TFP is insignificant.

The reminder of the study consists of examples of green economy applications, comprising examples on rationalizing resource use, such as water harvest applications, farming techniques that save space and water, solar energy usages, organic farming and by-product utilizations. Furthermore, the study reviews the commercial aspects of green economy applications, offering practical examples for commercially benefiting from these applications. In addition, the study presents a case study about green transition in South African Republic, illustrating how this transition was made, and what lessons can be drawn from it. Finally, the study ends with conclusion and recommendations.