

Linking women contribution in agriculture to food security: Evidence from developing countries

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Abstract

The paper aims to shed the light on the contribution of rural women and its contribution on food security issue, focusing on scientific foundations of econometrics and recent methodology. The present article attempts elucidate the role of rural women to improve the access to nourishment in developing countries. The theoretical advances regarding the topic female contribution in economics are abundant and significant.

The author attempted to find out the essence of the link between women contribution and food security through conducting an empirical research that focuses on modern approach in econometric analysis.

The empirical investigation carried out in the present paper enabled us to bear out the strong relationship between the contribution of women in agriculture and the improvement of food security index. It stems from the empirical research conducted on 85 developing countries in 2017 through the estimation of a cross-sectional panel, the positive effect of women on food security, their contribution is not limited solely on promoting food security. It stems from the empirical investigation that rural women are improving the 3 components utilized to construct the food security indicator: availability, affordability and the quality and safety.

Key words: food security, agriculture. Food policy, national security, Economic nationalism, agriculture, natural resources.

JEL – Classifications: Q18, F52, H56.

I - INTRODUCTION:

Food security issue in developing countries is not an innovative topic to debate in economics, it emerged after the advent of several financial and political crises threatening the access to food and nutrition for population. The problem of access to nourishment is the principal effect of the rise of living costs and the advent of new financial repressions in developing countries.

Skilled or unskilled women are contributing in economics as active actor, their role recorded a rapid growth in all societies over the world. The present paper attempts to determine the essence of the relationship tying women contribution to food security notion.

The increasing poverty and the continuous threats of undernourishment in rural areas made up the major concern of the bulk of developing countries. These critical problems raised the topic of food security as the main question to discuss.

The significance of the issue of food security seems obvious to denote through making up the global objective of heated debates in several international conferences, and the principal theme of several meetings of many UN organizations.

The observation of several reports about employment in agricultural sector allowed to underline the significant part of women working in agricultural activities in the bulk of developing countries. The firm relationship between agricultural production and food access motivated the author to determine the essence of the relationship existing between: the agricultural contribution of women and food security in developing countries.

II – ASSUMPTIONS:

The current paper relies on some hypotheses as principal foundations to provide the new framework of analysis regarding the essence of the relationship between economic contribution of women in agriculture and food security. We could sum up these bases in assuming these points:

- The contribution of women in agriculture is constant and non-seasonal in the same country.
- The contribution of women is proportional in the developing countries of the sample of the empirical investigation.
- The consumption of agricultural output contributes directly to ensure the food security of the population in overall.
- There is no discrimination in the population, habitants have the same access to food in developing countries.

III – LITERATURE REVIEW:

The present paper provides a prime attention for assessing the contribution of women in food security. It attempted to illustrate the significant role of women in rural regions to improve the access to food of households of the country.

1 – Definition of food security:

The concept of food security recorded some evolution over time. The development of other dimensions in restricting the appropriate definition for the new notion.

According to Athreya et al (2008), Food security is essentially relied on the availability of food from macroeconomic perspective. The author utilized the national dimension of food security as principal feature.

For the FAO, Food security should comprise 3 principal aspects: food should be available for all people at all times, the

access to food is guaranteed and sufficient for them, the nutrition should be sufficient to cover his dietary needs according to their preference and in favor of active and healthy life.

Referred to Amarty Sen (1981), the author highlighted that availability of foods did not ensure the consumption. In this context, Sen underlined 2 fundamental notions toward providing an accurate definition for food security: entitlement and endowment.

- The notion endowment indicated that people has the control to use a good.
- The notion entitlement described that the ability to acquire the good.

In addition of the evolution of the concept of food security, the FAO included the dimension of sustainability in his proper definition.

2 – Measure of food security:

The abundant theoretical background enabled us to infer the existence of various techniques and approaches to measure food security.

The most utilized approach relies on the micro-level perspective. It focused on implementing firm surveys about consumption of individual and households. The most significant advantage of this technique relies on providing concrete findings about consumption and share of population consuming less than a specific threshold of calories, considered as unsecured.

The second significant technique able to measure the concept of food security is the “household economy approach”: HEA. It attempts to provide a new framework of assessment regarding the quantity and the diversity of food consumed by a household during a predetermined period. The data collected are utilized to estimate the number of calories per capita and dietetic variety. The data also contributed to determine the

share of income oriented for consumption of foods of a household.

The FAO utilized another technique called “Sustainable Livelihoods Approach”: SLA. It includes a panel of quantitative and qualitative indicators regarding food security issue. The institution provides attention for all the level of analysis: national, household and per capita.

The FAO approach seems to be significant because of containing the impact of larger context (environment, institution, crisis...). The technique of SLA enabled to identify the causes of vulnerability of some groups regarding the problem of food security.

3 – The reasons of significance of the issue:

The preliminary analysis of diverse theoretical advances collected from some papers and reports, authorized us to consider that discussing the problem of food security in developing countries became a growing concern for various reasons:

- The rapid pace of urbanism of rural areas made up a major threat for the agricultural production in many developing countries. They are also specialized in agricultural products in international trade.
- The access to food seems to be unequal among households in several rural regions. Referred to the reports of FAO (2001), the organization highlighted the glaring inequality in income in rural areas.
- The increasing number of households migrating from rural to urban zones causes a particular type of precarious employment. It continues to affect the access of households to appropriate foods, and therefore, reduce the food security of these large shares of populations.
- The increasing share of population leaving under poverty line is the direct consequence of the receipt of weak wages in both urban and rural regions.

Undernourishment still to make up a significant type of poverty in many developing countries and one of the millennium development goals of the ONU¹.

4 – International organizations:

The heated debate about the pivotal role of women in economics leads us to analyze some crucial gender dimensions regarding the contribution of women in production in overall. The extensive analysis of the abundant literature focusing on studying the problem of food security allowed to highlight the considerable attention attributed from international organization to the question of food access.

The firm analysis of some reports of some international institutions, such as World Bank and FAO, attempting to discuss the topic of gender effect in agricultural activities underlined a significant finding. The reports took issue with the glaring discrepancy in income between men and women as the major threat thwarting the agriculture development in developing countries.

For international organizations, discrimination by gender made up a principal obstacle to develop the economic contribution of rural regions and to improve the quality of life of households. In the reports, the organizations underlined the direct relationship between discrimination by sex and the access to foods.

5 – The nexus between gender and food security:

From the literature review, the relationship between women and food security seems to be solid and obvious, because of the pivotal role of women in agriculture production and as food consumers in developing countries.

¹ Jaouadi, S. (2011), «l'efficacité de l'aide publique au développement et la réalisation des ODM : cas des donateurs », *Revue tunisienne d'économie*, CPU: Centre de publication universitaire, Numéro 16.

Previous studies highlighted the positive impact of women on food security as denoted by Yiridoe and Anchirinah (2005). In their survey, the authors found that women have raised the food security of household.

According to the research of Brow et al (1995)², women play a pivotal role in consolidating the food security in developing countries. The authors considered the presence of 3 different pillars through which the food security concept could be enhanced in the developing countries: women and agricultural production, women and economic access to food and finally, women and nutrition security.

Referred to Prakash, D. (2003)³, women continue to play pivotal role in agriculture production, for the author, it is obvious to distinguish its valuable contribution in rural regions of the Asia-Pacific and to enhance the food security of the population of the region. The author bare out that agricultural cooperatives contributed to facilitate the mission of rural women in agriculture production, and thus, to improve the food security of some Asian-Pacific countries.

For Thrupp, L. A. (2000)⁴, there is positive correlation between agro-biodiversity and the food security in emerging countries. The author consolidated the formulation of agricultural policies that target to adopt the biodiversity as highway to reach a sustainable agriculture and thus, it positively affects the food security in the developing countries. The author also underlined the valuable contribution of rural women in improving the agriculture production through their knowledge in plants and tree species. The thorough review of several studies regarding the role of women enabled to

² Brown, L. R., Feldstein, H. S., Haddad, L., & Peña, C. (1995). Women: The key to food security.

³ Prakash, D. (2003). Rural women, food security and agricultural cooperatives. *Rural Development and Management Center, New Delhi, India.*

⁴ Thrupp, L. A. (2000). Linking agricultural biodiversity and food security: the valuable role of agrobiodiversity for sustainable agriculture. *International affairs*, 76(2), 283-297.

underline that urban women continues to play a pivotal role to consolidate the security food in some developing countries. Levin, C. et al (1999) raised the present argument through discussing the topic of urban women contribution in ensuring the food access for their families in Ghana. In the empirical research, the authors carried out a questionnaire to collect data to find out the role of urban women regarding facilitating the access to food from working in trade activities. The authors found a positive correlation between women activities and access to food and nutrition in Ghana. The authors argued: “Interhousehold transfers of money and food play a very important role in Accra, especially for female-headed households”⁵.

According to Ahmed and Lorica (2002)⁶, there is a close relationship between aquaculture and food security, the authors asserted the existence of a positive correlation between the food security and the aquaculture. They argued the significant role of women through raising their commitment and involvement in the various stages of aquaculture activities in Asia. And hereby, women had positively affected the food security in several Asian countries.

For other researchers, agricultural activities of women harmed food security through the increase of number of alcoholic men, their need for alcohol reduced the money available for purchasing foods and grain, and hereby, they considered that women seems to have negative impact on food security.

Although various studies bare out the presence of gender inequality in rural regions, for instance: it seems that women worked for longer time than men did. Also, the income of men is

⁵ Levin, C. E., Ruel, M. T., Morris, S. S., Maxwell, D. G., Armar-Klemesu, M., & Ahiadeke, C. (1999). Working women in an urban setting: traders, vendors and food security in Accra. *World Development*, 27(11), 1977-1991.

⁶ Ahmed, M., & Lorica, M. H. (2002). Improving developing country food security through aquaculture development—lessons from Asia. *Food Policy*, 27(2), 125-141.

higher than women in agricultural activities. Other studies illustrated that the income under the control of women has a positive impact on the wealth of children more likely than revenues of men. The findings underlined that the positive impact of the expenditure of women was observed in consumptions related to education and food.

IV – EMPIRICAL RESEARCH:

The empirical investigation attempts to provide an innovative framework of analysis concerning the contribution of women in agriculture sector and its effect on the food security of developing countries.

1 – Methodology:

The objective of the empirical research is not limited on determining the nature of the effect of women contribution on food security. The study will be extended to identify the effects of women in agricultural sector on the 3 main components constructing the index of food security: “availability”, “affordability” and “quality and safety”.

The empirical investigation relies on estimating a cross sectional panel, taking as year of reference 2017. The panel of the research contained 85 developing countries. It includes: Algeria, Angola, Argentina, Azerbaijan, Bangladesh, Belarus, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Chad, Chile, China, Colombia, Congo Dem. Rep., Costa Rica, Cote d’Ivoire, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Ghana, Greece, Guatemala, Guinea, Haiti, Honduras, Hungary, India, Indonesia, Israel, Jordan, Kazakhstan, Kenya, Madagascar, Malawi, Malaysia, Mali, Mexico, Morocco, Mozambique, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Romania, Rwanda, Saudi Arabia, Senegal, Serbia, Sierra

Leone, Singapore, Slovakia, South Africa, Sri Lanka, Sudan, Syria, Tajikistan, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, Uruguay, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia.

2 – Model:

The equation representing the relationship of causality between contribution of women in agriculture and the food security has the following form:

$$\mathbf{Food\ security\ index}_i = \alpha + \beta X_i + \varepsilon_i \quad \mathbf{(Equation\ 1)}$$

Food security index is the endogenous variable that we tend to explain.

X: the panel of explanatory variables utilized in the research and presented in details in the next section.

ε_i is the error term. i: the indicator identifying the 85 countries of the study.

Before the estimation, we applied the test of Unit roots of ADF to be sure that data utilized are stationary and thus, to avoid any problems of spurious regression in the pattern estimated.

3 – Explanatory variables:

The present section of the paper provides detailed presentation of the variables utilized to illustrate the determinants affecting the evolution of the food security index. The index was elaborated under the assistance of “The Economist” and “Intelligence Unit”, it includes 3 dimensions related to the security of food: “availability, affordability and quality”.

The present empirical research attempted to find out the accurate contribution of rural women to enhance the food security in developing countries.

- Forest area as percentage of the land area: it is utilized in the estimation to indicate the green space in the country.

- Land area in square meter: reflecting the factor land used in the production in agricultural sector.
- Agricultural land as percentage from total land: representing the share of the land allocated for agricultural activities.
- Agriculture value added per worker: representing the productivity of workers in the agricultural sector.
- Arable land in hectares per person reflecting the share of land fertile and seems appropriate for agricultural activities.
- Fertilizer: representing the consumption of fertilizer utilized in the agricultural production.
- Labor participation rate of population aged more than 15.
- Female labor participation is the female labor force as percentage from total labor.

4 – Source of data:

We could put forward the source of data utilized in the empirical investigation of the paper as following:

Variable	Source of data
Food security index	Global Food Security Index 2017
Forest area	World Development Indicators 2017
Land area	World Development Indicators 2017
Agricultural land	World Development Indicators 2017
Agriculture value added	World Development Indicators 2017
Arable land	World Development Indicators 2017
Fertilizer consumption	World Development Indicators 2017
Labor participation above 15 years	Gender Statistics of World Bank 2017
Female labor participation	Gender Statistics of World Bank 2017

Table 1: the source of the variable of the empirical research.

5 – Findings and interpretation:

The estimation of the model presented in previous section of the present paper authorized us to obtain some interesting findings.

The results of the empirical investigation targeting to find out the impact of women in agricultural sector on the food security of 85 developing countries, are presented in the following table.

Endogenous variable	Food security index	Availability	Affordability	Quality and safety
Female labor share	0.55** (2.09)	0.41 (1.52)	0.6* (1.82)	0.87*** (2.6)
Forest area	0.05 (0.8)	0.08 (1.27)	0.01 (0.19)	0.003 (0.04)
Land area	7×10^{-7} (1.14)	8×10^{-7} (1.33)	9.8×10^{-7} (1.2)	1.1×10^{-6} (1.5)
Agricultural land	0.01 (0.23)	0.01 (0.17)	-0.02 (-0.3)	-0.04 (-0.48)
Agriculture value added	-0.84*** (-8.47)	-0.53*** (-5.02)	-1.2*** (-9)	-0.9*** (-7)
Arable land	4.9 (1.12)	0.1 (1.23)	0.07 (0.79)	0.09 (0.96)
Fertilizer consumption	0.009*** (3.17)	0.008*** (2.97)	0.009*** (2.7)	0.004 (1.31)
Labor participation	-0.29** (-2.18)	-0.28* (-1.95)	-- --	-0.44** (-2.53)
C	49.8*** (8.8)	47.6*** (7.8)	53.7*** (7)	52.7*** (7.2)
R Squared	75.6%	59.2%	76.5%	67.4%
Fisher test	0.000	0.000	0.000	0.000
Durbin Watson test	1.85	2.1	2.2	1.97

Table 2: The Findings regarding the contribution of women on food security in developing countries.

The thorough analysis of the findings of the empirical research enabled us to denote some interesting deductions:

From the content of table 1, it arise that the rise in the female labor participation in agriculture is associated with an improvement in the global food security index, the impact is positive and statistically significant at 5%. The outcome of the empirical investigation are in accordance with the deductions of the survey of Brown, L. et al (1995)⁷, the authors underlined that women in developing countries played a pivotal role to improve the food and the nutrition needs of their families. The deep empirical investigation about the effects of the

⁷ Brown, L. R., Feldstein, H. S., Haddad, L., & Peña, C. (1995). Women: The key to food security.

contribution of female participation on the components of the food security index. It authorized to underline that women were contributing extensively in enhancing the quality of the food produced in agriculture, according to the definition of the component that “measures the variety and nutritional quality of the average diet, as well as the safety of food”⁸. The last deduction seems to be an innovative finding regarding the contribution of rural women in ensuring the access to food in their countries.

The impact of female contribution in agriculture remains insufficient to affect significantly the affordability to food. Referred to the definition of affordability to the original documentation regarding the calculation of the security food index, the component affordability provides accurate measure regarding “the ability of consumers to purchase foods, their vulnerability to price shocks and the presence of programs and policies to support consumers when shocks occur”⁹. From statistical perspective, the non-significance of the impact of women effort in agricultural regions to enhance the affordability to food authorized to denote that women in developing countries continues to be neglected and discarded from the economic policies formulated in developing countries to reduce the effects of the inflation of food prices. The illustration of the finding relies on the vulnerability of rural women to the rapid rise of nourishment prices and their limited ability to purchase foods. Referring to Barbier (1997), the rural population have limited access to capital due to the stagnation of their income¹⁰.

For the value of agriculture to the food security in developing countries, the rise in the value of the agriculture is associated to a decrease in the food security index, the effect is

⁸ Datasheet of the Food Security Index.

⁹ Datasheet of Food Security Index.

¹⁰ Barbier, E. B. (1997). The economic determinants of land degradation in developing countries. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 352(1356), 891-899.

statistically significant at 1%. The harmful impact of agriculture in developing countries is also deduced on its impact on the 3 components of the food security index. We could illustrate the outcome through underlining the traditional means of production in agriculture that remain to be dominant in the bulk of the developing countries. In fact, the utilization of traditional system of production in agriculture, known as subject of limited productivity in the developing countries made up the major vulnerability and it could illustrate the harmful impact of the value of agriculture. Gebbers and Adamchuk (2010)¹¹ raised the same argument, the authors stressed that diversity of ecology in developing countries would improve the contribution of agriculture sector to enhance the sort of the population and to guarantee the access to nourishment.

It seems the utilization of fertilizer improved the food security in the developing countries. Thus, the rise in the consumption of fertilizer is associated with an increase in the food security index. The impact is statistically significant at 1%. The use of fertilizer to enhance the productivity in agriculture recorded a huge increase in developing countries in overall, and in Asian countries especially. The empirical research allowed to underline the non-significant effect of fertilizer on the quality of the food, because the fertilizer are utilized to increase the productivity in agriculture without improving the quality of food produced. The finding of the empirical research regarding the positive impact of fertilizer consumption remains in accordance with the study of Hossain and Singh (2000), the authors stressed: “the lack of fertilizer will affect national food security”¹².

For the share of labor participating in agriculture, it arose that it had a harmful effect on the food security in the

¹¹ Gebbers, R., & Adamchuk, V. I. (2010). Precision agriculture and food security. *Science*, 327(5967), 828-831.

¹² Hossain, M., & Singh, V. P. (2000). Fertilizer use in Asian agriculture: implications for sustaining food security and the environment. *Nutrient Cycling in Agroecosystems*, 57(2), 155-169.

developing countries of the empirical research. The rise in labor is joined with a decrease in the food security, the negative impact is statistically significant at 5%. The illustration of the outcome relies on the less qualification of workers in agriculture that continue to utilize traditional tools. The paper of Savadogo et al (1998) raised the significance of changes in labor productivity could improve the food security. The authors argued: “These changes in farm productivity in general translate into changes in farm household incomes, asset holdings, and food security”¹³.

The findings enabled to underline some explanatory variables affecting positively the food security but statistically non-significant, as well as: arable land, land area, forest area and agricultural land. The illustration of the outcome focuses on the poor quality of the land in the bulk of developing countries and the limited productivity of land in modern agriculture production. In fact, the technological revolution altered the production processes in agriculture through enhancing the productivity of land factor. The focus of developing countries on agricultural products as highway to create value from international trade has contributed in the degradation of the productivity of land. According to Barbier (1997), the declining productivity of arable land in rural regions of developing countries affecting the income of rural households¹⁴. The author also stressed that land degradation was associated with deforestation in developing countries that we could consider as factor to illustrate the non-significance of the forest area

¹³ Savadogo, K., Reardon, T., & Pietola, K. (1998). Adoption of improved land use technologies to increase food security in Burkina Faso: relating animal traction, productivity, and non-farm income. *Agricultural systems*, 58(3), 441-464.

¹⁴ Barbier, E. B. (1997). The economic determinants of land degradation in developing countries. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 352(1356), 891-899.

CONCLUSION:

The present paper provides a new analytical framework to underline the beneficial impact of rural to improve the food security. The major findings bare out the contribution of rural women in enhancing the access to nourishment. Although, governments of developing countries should attribute a prime attention for their economic policies because the empirical analysis applied to the affordability component of the food security index allowed to underline that rural women seems to be more vulnerable to the prices shocks of food because of their limited income and financial means.

The thorough review of the literature regarding the issue of food security in developing and poor countries, authorized to underline the existence of various economic perspectives that affects significantly the food security of developing countries, as the present paper attributed particular attention for rural women.

The conduct of new surveys regarding the effects of some concise fields of production or some specific economic actors on food security in developing countries seems to be significant to clarify the theoretical foundations to enhance the access to food and nutrition for the poor.

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