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Gender differences in profit efficiency among youth producer-marketers in Rice and Maize marketing in Cameroon

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Abstract

This study assessed whether there is difference in the determinants of profit efficiency among males and females youth producer-marketers in rice and maize marketing in Cameroon. Using a multistage, stratified and simple random sampling technique to collect 1019 farmers made of 428 (288 males and 140 females) and 591 (434 males and 157 females) rice and maize farmers respectively from three (3) regions (Far North Region, North Region and West Region) out of ten (10) regions that made up Cameroon. The study found that there is a significant difference in the determinants of profit efficiency among males and females youth producer-marketers in rice and maize marketing. Given that price of labour significantly reduce females maize and rice youth producer-marketers' profit. It is suggested that females rice and maize youth producer-marketers should be encourage to register into proactive association for mutual help in farm labour which could in turn considerably reduce price of labour and increase their profitability.

Keywords: Profit efficiency, youth, producer-marketers

Introduction

The rapid changes occurring in the agriculture sector present opportunities and challenges for the sector 's central role in poverty reduction and food security (World Bank, 2009). Markets and the demand for agricultural commodities are changing rapidly, especially for higher-value products (World Bank, 2009). These changes may create opportunities for greater market participation for both women and men; however, for women in particular, to date, equal access to these markets is still limited (World Bank, 2009). In Cameroon, the agricultural sector employs over 60 percent of the active population; ensures a large share of the country's food security; generates foreign exchange earnings(up to 55 percent of export earning) and contributes up to 20 percent of gross domestic product (GDP) (Amadou, 2007; Gama, 2013; Djomo, 2015). Moreover, agricultural activity induces most of the multiplier effects on other sectors of the economy; thus contributing to export diversification, job creation and poverty reduction (INS, 2005; Djomo, 2015). Until the late 1980s in Cameroon, Maize was considered by many in as crop only for home consumption (can be roasted, boiled, eaten in form of pudding, transformed to flour eaten as porridge or fufu and fermented to traditional beer) and not for cash (Program of Accompanying Research for Agricultural Innovation (PARI), 2015). However, with high demands from the brewery companies and livestock sector, its production is gaining more importance as a cash crop. The production has increased drastically from 280,000 metric tons in 1960 to 1,647,036 in 2013. It is the most widely grown crop in the country (PARI, 2015). In addition to being an important staple food in most parts of the country (especially in the grassland areas), it is also widely used to produce feed for livestock all over the country (PARI, 2015). In order to boost Rice production and farmers ability to increase their earnings (profitability) in Cameroon, three development companies were created by the Cameroonian government, namely: *Societed'Expansion et de Modernisation de Riziculture de Yagoua (SEMRY)* in 1954; the Upper Noun Valley Development Authority (UNVDA) in 1974 and *the Societe de Development de la Riziculturedans la plaine de Mbo (SODERIM)* in 1978. Despite these magnitudes of investment, Cameroon produces an estimated 80,000 metric tonnes of rice annually which is far short of the over 500, 000 metric tonnes required to meet national demand (MINAGRI, 2002; Djomo, 2015). Gender dimension is crucial for economic reasons and from the efficiency point of view (World Bank, 2009). This is especially true in the agriculture sector, where gender inequalities in access to and control over resources are persistent, undermining a

sustainable and inclusive development of the sector. Also, gender differences, arising from the socially constructed relationship between men and women, affect the distribution of resources between them and cause many disparities in development outcomes (World Bank, 2009). Emphasis on the link between gender and agriculture has existed as long as the concept of gender itself. Today it is recognized that women in developing countries are important contributors in small-scale agriculture, rural workforce and daily family subsistence (Deere and Leal, 2001; Villabón, 2012). Despite these important roles, women have greater difficulty than men accessing resources such as land, credit, agricultural inputs and services that increase their productivity and the possibility to enhancing their family's well-being (Deere and Leal, 2001; International Fund for Agricultural Development (IFAD), 2009; Villabón, 2012). A growing body of empirical evidence from both developing and developed countries now indicates that allocation decisions within households are commonly not consistent with the unitary household model (Quisumbing, 1996; Njuki et al., 2006). Allocation decisions appear to reflect both difference in preferences among different household members and differences in resource control including income, assets and education as well as external factors to the household such as laws, norms and institutions (Njuki et al., 2006). Several studies (Djomo *et al.*, 2014; Djomo and Malaa, 2014; Djomo, 2015) have been carried out on maize and rice in Cameroon with little or no emphasis on the gender differences in profit efficiency among youth producer-marketers. The contention of this study is to find out if price of labour, price of fertilizer, price of seeds, price of herbicides, price of transport, tax paid and selling price affect males and females youth producer-marketers in the marketing of rice and maize or whether factors such as age, amount of credit received, membership of association, experience, household size, years in school and distance to market significantly affect the profit efficiency level among males and females youth producer-marketers or otherwise in the marketing of Rice and Maize in the context of Cameroon.

Theoretical Framework

Considering that this study find out whether there is a differential in the profit efficiency among males and females youth engaged in the marketing of Rice and Maize in Cameroon. Therefore, this study will focus on the theory of efficiency using Stochastic Frontier framework's profit frontier.

The stochastic frontier analysis (SFA) is a stochastic method because it allows individuals to be distant from the frontier and also for randomness (Aigner et al., 1977; Meeusen and van de Broek, 1977; Aiello and Bonanno, 2013). It differs from the Data Envelopment Analysis (DEA) which supposes that distance from the frontier is entirely due to inefficiency. Again, SFA assigns a distribution to the stochastic component of the model and, thus, allows to make inference (Simar and Wilson 2000; Aiello and Bonanno, 2013). A further advantage of SFA derives from the specification of Battese and Coelli (1995), which improves, in terms of consistency, previous modelling where one firstly estimates inefficiency using a frontier and, secondly, uses the estimated efficiency-score as the dependent variable in subsequent regression (Greene 1993; Aiello and Bonanno, 2013). As shown by Lensink and Meesters (2012) and Wang and Schmidt (2002), the two-step approach suffers from the fact that the inefficiency is assumed to be identically and independently distributed in the main frontier equation, while it depends on other variables in the inefficiency equation (Aiello and Bonanno, 2013). Another drawback of the Stochastic Frontier Analysis (SFA) is that it imposes a particular functional form (and hence all its associated behavioral assumptions), which predetermines the shape of the frontier. If the functional form is mispecified, the estimated efficiency may be confounded with significant bias.

Following Aiello and Bonanno, (2013), the profit function Fp(.) states the profit obtainable from producing y at input price w.

$$Profit_{it} = F_P\,(y,w)e^{yp}e^{-up} \qquad (1)$$

Equation (1) is an alternative profit function since it depends on inputs and outputs, whereas actual profits depend on the prices of output. It uses the same variables as the cost function, implying that output-prices are free to vary (Huizinga *et al.*, 2001; Aiello and Bonanno, 2013). Similarly, profit efficiency of males and females (Rice and Maize producer-marketers) is the ratio between the observed respondent's (Rice and Maize Producer-marketers) profit and the maximum level of profit achievable in case of full efficiency (Aiello and Bonanno, 2013).

$$PE = \frac{F_P(w,y)e^{vp}e^{-up}}{F_P(y,w)e^{vp}} = e^{-up} \qquad (2)$$

Methodology

The study area

The study was conducted in the Far North, North and West Regions of Cameroon. Far North Region of Cameroon has six divisions namely Diamaré,Logone-et-Chari,Mayo-Danay, Mayo-Kani,Mayo-Sava,Mayo-Tsanaga and it is located within latitude 11°30′43.20″ North and longitude 14°33′03.60″ East (https://wiki.openstreetmap.org/wiki/Far_North,_Cameroon).

North Region makes up 66,090 km² of the northern half of The Republic of Cameroon. Neighbouring territories include the Far North Region to the north, the Adamawa Region to the south, Nigeria to the west, Chad to the east, and Central African Republic to the southeast. The region is divided into four divisions namely Benue, Faro, Mayo-Louti and Mayo-Rey. It is located within latitude 8.5809° N and longitude 13.9144° E (en.wikipedia.org/wiki/North_ Region).

West Region of Cameroon has eight divisions, namely: Bamboutos, Haut-Nkam, Mifi, Menoua, Khoung-khi, Nde and Hauts-Plateaux. The West Region is located in the West-Central part of Cameroon within latitudes 5° 20' and 7° North and longitude 9° 40' and 11° 10' East (Yerima and Van, 2005).

Method of Data Collection

Primary data were collected with the aid of structured questionnaires, the youth producer-marketers of Maize and Rice were interviewed with the aid of fields guide who served as enumerators.

Population and Sampling Techniques

The population of the study comprised all males and females Maize and Rice youth producer-marketers in Cameroon. The definition of youth considered in this study is limited to the Cameroon's civil service regulation which consider *youth* as persons aged from *18* to *40 years.* Multi-stage, stratified and simple random sampling techniques was adopted to select 1019 respondents made of 428 (288 males and 140 females) and 591 (434 males and 157 females) Rice and Maize youth producer-marketers respectively from three (3) (Far North, North and West Regions) out of the ten (10) Regions that make up Cameroon based on the *a priori* knowledge that those Regions are among the highest Maize and Rice producing areas.

Techniques of Data Analysis

Stochastic profit function model was used to estimate profit efficiency among males and females youth producer-marketers in the marketing of Maize and Rice.

Models Specification

Stochastic profit function model for the effect of socioeconomic factors on profit efficiency and estimation of profit efficiency among males and females youth producer-marketers in the marketing of Maize and Rice the study area.

In this study, Cobb-Douglas stochastic frontier production function is assumed to be the appropriate model for the analysis of the marginal profit of variables cost incurred by males and females rice and maize youth producer-marketers and the profit efficiency of males and females rice and maize youth producer-marketers (Ogundari, 2006). In addition, a gender dummy was used in the profit function model to explain profit efficiency differences among males and females rice and maize youth producer-marketers. Therefore, the Cobb-Douglas functional form is specified as following Ogundari (2006):

$$Ln\ Gross\ Margin = \beta0 + \beta1\text{Ln(price of Labour)} + \beta2\text{Ln(dummy for price of labour)} + \beta3\text{Ln(price of seeds)} + \beta4\text{(dummy for price of seeds)} + \beta5\text{(price of fertilizer)} + \beta6\text{(dummy for price of fertilizer)} + \beta7\text{(price of herbicides)} + \beta8\text{(dummy for price of herbicides)} + \beta9\text{(sellingprice)} + \beta10\text{(dummy for sellingprice)} + \beta11\text{(price of transportation)} + \beta12\text{(dummy for price of transportation)} + \beta13\text{Ln(Tax paid)} + \beta14\text{Ln(dummy for tax paid)} + V1 - U1$$

This is assumed to be independently distributed such that Non negative random variables obtained by truncation (at zero) of the normal distribution with variance(δ^2) and meanU_1.

The inefficiency of profit function model is expressed in terms of factors such as :

$$U1 = \sigma0 + \sigma1\text{(Age)} + \sigma2\text{(dummy for age)} + \sigma3\text{(Household size)} + \sigma4\text{(dummy for household size)} + \sigma5\text{(Experience)} + \sigma6\text{(dummy for experience)} + \sigma7\text{(Years in school)} + \sigma8\text{(dummy for years in school)} + \sigma9\text{(Distance to market)} + \sigma10\text{(dummy for distance to market)} + \sigma11\text{(Membership to association)} + \sigma12\text{(dummy for membership to association)} + \sigma13\text{(Amount of credit received)} + \sigma14\text{(dummy for amount of credit received)}$$

Where

Price of labour is measure in FCFA, it is the cost incurred by Rice and Maize producer-marketers per labourer in mandays for activities such as clearing, planting, weeding, agrochemicals application and harvest.

Price of seeds is measured in FCFA, seeds are the foundation of agriculture. Technology has modernized much of farming's day-to-day operations, but without a steady supply of high-quality seed, yields and crop quality would be greatly decreased (Ferguson *et al.,* 1991).

Price of fertilizer is measured in FCFA, fertilizer is a substance containing the chemical elements that improve growth and productiveness of plants. Fertilizers enhance the natural fertility of the soil or replace the chemical elements taken from the soil by previous crops (https://www.britannica.com/topic/fertilizer).

Price of herbicides is measured in FCFA. The use of herbicides is increasing in various developing Asian and African countries due to the availability of low-cost herbicides and because of a similar shortage of manpower (Gianessi, 2013).

Selling Price is measured in FCFA, it is a price at which a producer-marketer sell his produce (Rice and Maize) in the market. It is used because agricultural price fluctuations may affect not only farm revenues but also the price farmers pay for the products they consume (Fafchamps 1992). It also determine the level of competitiveness of a firm given that the primary objective of a firm is profit maximization.

Transportation Cost is measure in FCFA, it is cost incurred by Rice and Maize marketers from moving their goods to market.

Tax paid is measure in FCFA, it is a mandatory charge for everyone involved into income generated activity in Cameroon.

Age is measure in years. It is used because it can affect productivity over time

Years in school is measure in number of years. It is used because it is associated with skills and knowledge.

Experience is measure in years. It is used because it is associated with practical knowledge

Amount of credit used is measured in FCFA. It is used because the embodied capital approach stresses the importance of credit as a means of investing to keep up with production frontier as it shifts upwards over time and thus maintain or improve efficiency (Cramon-Taubadel and Saldias, 2014).

Household Size is measure in number of people living in a household. it is used because it provides an overview of the contribution of family labour to the performance of Rice and Maize marketers.

Membership to association is measure in dummy variable (member = 1, non member = 0). It is used because it displays the dynamics among farmers which help to disseminate market information

Distance to market is measure in kilometre. It is used because it increases access to customers. Hence improving efficiency of Marketers.

Table 1: A priori expectation for Variables used in Stochastic profit function model

Variables	A priori expectation
Price of labour of labour	negative
Price of seeds	negative
Price of fertilizer	negative
Price of price of herbicides	negative
Selling price	positive
Price of transportation	negative
Tax paid	negative
Age	positive
Household size	negative
Experience	negative
Years in school	negative
Distance to market	positive
Membership to association	negative
Amount of credit received	negative

Results and Discussion

Table 2: Summary Statistics of Socioeconomic and financial factors for Males and Females Maize Youth Producer-Marketers

Variables	Males		Females		Pooled data	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Gross Margin	212,463.21	359,921.58	161,306	127,425.81	198903.7	316017.7
Price of labour	32192.65	38556.5	83086.04	74571.55	45712.55	55385.04
Price of seeds	4860.323	5289.262	3833.121	3037.303	4587.445	4814.265
Price of fertilizer	62630.99	60714.22	43812.1	21057.95	57601.27	53802.67
Price of herbicides	9257.719	10170.51	8688.854	4618.173	9106.599	9034.171
Age	35.08	12.85	32.03	9.24	33.80	12.56
Household size	7.728	4.76	5.59	4.10	7.16	4.69
Experience	11.27	9.30	8.36	7.05	10.50	8.85
Years in school	7.85	4.28	6.16	3.72	7.40	4.20
Monthly income	22434.79	19904.67	19105.1	10238.98	21560.41	17899.67
Farm size	2.14	2.36	1.84	.901	2.06	2.08
Output	3233.45	3961.81	2353.50	1269.84	2999.69	3478.06
Selling price	144.75	57.65	139.17	20.75	143.38	19.02
Distance to market	16.41	27.32	38.59	51.04	22.30	36.50
Amount of credit received	1728.11	17955.8	872.61	8081.89	1500.84	15938.32
Price of transport	14955.25	27307	17152.87	13736.31	15539.05	24455.7
Tax Paid	1223.50	1856.47	2046.49	1810.31	1442.13	1878.37

Table 3: Summary Statistics of Socioeconomic and financial factors for Males and Females Rice Youth Producer-Marketers

Variables	Males		Females		Pooled data	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Gross margin	243,375.24	196,060.83	242,606.99	196,215.86	243123.9	195882
Price of labour	29315.35	29052.5	25264.44	24755.49	27831.68	27724.63
Price of seeds	8270.486	5730.613	8300	4251.915	8280.14	5287.538
Price of fertilizer	80321.39	58500.97	77771.43	57325.94	79487.29	58064.44
Price of herbicides	4724.306	9196.191	3932.143	2375.846	4465.187	7669.29
Age	38.75	13.56	36.06	10.74	37.87	12.76
Household size	7.75	4.46	6.2	3.09	7.24	4.12
Experience	16.56	12.77	12.58	9.69	15.26	11.99
Years in school	6.88	3.98	6.17	4.28	6.65	4.09
Monthly income	37810.76	31796.33	28752.14	29298.03	34847.66	31257.91
Farm size	.83	.62	.76	.53	.81	.59
Output	4062.15	2893.93	3298.57	2365.24	3812.38	2752.95
Selling price	133.94	57.82	160.35	63.15	142.58	60.82
Distance to market	25.32	14.96	24.5	15.27	25.05	15.05
Amount of credit received	21875	75991.41	6214.28	29491.32	16752.34	64950.63
Price of transport	19285.24	27741.59	15437.86	12012.14	18026.75	23822.38
Tax Paid	3618.75	4537.09	3712.14	4320.71	3649.29	4462.62

Effect of socioeconomic factors on profit efficiency among males and females rice and maize youth producer-marketers

The stochastic frontier profit function model used to analyze the effect of socioeconomic factors on profit efficiency of males and females rice and maize youth producer-marketers in Cameroon is presented in table 4. The profit efficiency estimates is compare for both males and females rice and maize youth producer-marketers. In order to determine the marginal effect of price and socioeconomic factors in the profit function model for the two groups of farmers (males and females), a gender dummy is associated to each of the price and socioeconomic factors to ascertain the difference on profit earned as well as their inefficiency. Further, the significance of a gender dummy attached to any of the variables assumed a gender difference among males and females rice and maize youth producer-marketers for the specific variable of interest. The estimated coefficient of the inefficiency function provides some explanation for the relative profit efficiency levels among individual farmers. Since the dependent variable of the function represents inefficiency, a positive sign of estimated parameter implies that the associated variable has a negative effect on profit efficiency and vice versa.

For males and females rice and maize youth producer-marketers, results show that the estimated coefficients of Sigma_v (.24*** and .57***) are significant at 1% level of probability. This indicates the goodness of fit and correctness of the specified distribution assumption of the composite error terms. The estimated Lambda (2.35*** and 1.45***) are significant at 1% level of probability implying that 2.35% and 1.45% of the variability in rice and maize profit is due to profit inefficiency.

Results show that price of labour, gender dummy for labour, price of seed, gender dummy for seed, selling price, gender dummy for selling price, price of transport, gender dummy for price of transport, tax paid and gender dummy for tax paid are the variables that significantly affect profit of males and females rice producer-marketers while price of labour, gender dummy for labour, price of seed, price of herbicides, gender dummy for herbicides, selling price and price of transport are the variables that affect profit of males and females maize producer-marketers.

Specifically, the estimated coefficients of price of labour (.03***) and gender attached to labour as dummy (.02**) are positive and significant at 1% level of probability for males and females

rice youth producer-marketers. These results are contrary to a priori expectation and suggest that a unit increase in price of labour will increase males and females rice youth producer-marketers' profit by 0.3% and 0.2% respectively. The result implies that there is a gender difference in the price of labour among males and females rice youth producer-marketers which could be due to the fact that both males and females are eager to increase their productivity through intensive use of labour and are ready to spend as much (25,264.443 FCFA and 29,315.347 FCFA for females and males respectively) as possible on labour to meet up with all the farm activities such as clearing, planting, weeding, fertilizer application and harvesting. Also, the slight difference in the expenses on labour could be due to limited access to credit by females rice youth producer-marketers. This result is in line with Ashok et al. (2017) who found that increase in the price of labour will increase profit of females rice farmers in Philippines. As for males and females maize youth producer-marketers, the coefficient of labour (.03***) is positive and significant at 1% level of probability. This result is contrary to a priori expectation and suggest that a unit increase in the price of labour will increase males maize youth producer-marketers' profit by 0.3%. The coefficient of gender dummy attached to labour (-.08***) is negative and significant at 1% level of probability. This result is in line with a priori expectation and suggest that a unit increase in the price of labour will reduce the profit of females maize youth producer-marketers by .08%. This result implies gender a difference in the price of labour among males and females Maize youth producer-marketers which could be explained by the average limited amount of credit received (872.61 FCFA) by females maize youth producer-marketers compare to the males counterpart (1728.11 FCFA) in the study area. This result could also be explained by the fact that women generally face gender-specific constraints as agricultural labourers and in hiring-in labour. Low levels of human capital, i.e. education, health and nutrition, are a constraint to women's labour productivity in agriculture and other sectors (Behrman *et al.,* 2004; SOTA team, 2011).

The coefficient of price of seed (.58***) is positive and significant at 1% level of probability. This result is contrary to a priori expectation and suggest that a unit increase in the price of seed will increase the profit of males rice youth producer-marketers by .58%. This could be due to the fact that majority of males youth producer-marketers (76.04% against 23.96%) use improved seed varieties to increase their output which in turn will increase their profit. This result is in line

with the findings of Ogundari (2006) who found that increase in price of seed will increase profit of small scale Nigerian rice farmers. In contrast, gender dummy attached to price of seed (-.61***) shows a negative and significant coefficient at 1% level of probability. This result is in line with the a priori expectation and suggest that a unit increase in price of seed will decrease the profit of females rice youth producer-marketers by -.61%. The result implies that there is gender difference in price of seed among males and females rice youth producer marketers which could be explained by SOTA team (2011); Doss and Morris (2001) who reported that females farmers had a much lower adoption rate of modern crop varieties (59 versus 39 percent) due to less access to land, lower availability of family labour, and less access to extension services. This result is contrary to the findings of Ashok et al. (2017) who found that increase in seed cost will increase profit of females Rice farmers in Philippines. For males and females maize youth producer-marketers, results show that the coefficient of seed (.16***) is positive and positive at 1% level of probability. This result is contrary to a priori expectation and implies that a unit increase in the price of seed will increase males maize youth producer-marketers profit by .16%. The coefficient of gender dummy attached to price of seed (.14) is positive and not significant. This result implies that there is no gender difference in the price of seed among males and females Maize producer-marketers.

For maize, results show that the coefficient of herbicides (.08***) is positive and significant at 1% level of probability. This result is contrary to a priori expectation and suggest that a unit increase in the price of herbicides will increase the profit of males maize youth producer-marketers by .08%. The coefficient of gender dummy (-.31**) attached to price of herbicides is negative and significant at 5% level of probability. This result is in line with the a priori expectation and indicates that a unit increase in the price of herbicides will reduce profit of female maize youth producer-marketers by .31%. This result implies that there is gender difference in the price of herbicides among males and females maize youth producer-marketers in the study area. This result could be due to factors such as average size of farm (1.84 hectares against 2.14 hectares) and average amount of credit received (872.61 FCFA against 1728.11 FCFA) by females maize compare to counterpart males in the study area

Also, the results show that the coefficients of selling price (.21**) and gender dummy attached to selling price (.25***) are positive and significant at 5% and 1% level of probability respectively. This result is in line with the a priori expectation. This result suggest that a unit increase in selling price will increase the profit of males and females rice youth producer-marketers by.21% and .25% respectively. The result implies that there is gender difference in selling price among males and females rice youth producer-marketers which could be due to the volatility nature of market price which may likely affect the decision of both males and females rice youth producer-marketers to sell their produce or otherwise (133.94 FCFA and 160.35 FCFA for males and females respectively). For maize, the coefficients of selling price (1.37***) is positive and significant at 1%. This result is in line with the a priori expectation and implies that a unit increase in the selling price will increase profit of males maize youth producer-marketers by 1.37%. This result could be explained by the average selling price (144.75 FCFA) and the high demand for Maize in the study area. The coefficient of gender dummy attached to selling price is positive (.43) but not significant. This result implies that there is no difference in selling price among males and females Maize youth producer-marketers.

The results also show that coefficients of tax paid (.03***), gender dummy attached to tax paid (.04**), price of transport (.15***) and gender dummy attached to price of transport (.35***) are significant at 1 and 5% level of probability. This result is against the a priori expectation and implies that a unit increase in tax paid and price of transport will increase profit of males and females rice youth producer-marketers by .03%, .04, .15% and .35% respectively. This result also implies that there is gender difference in tax paid and price of transport among males and females rice youth producer-marketers which could be explained by the fact that whenever, there are increments in tax paid or in the price of transport, these translates into increase in selling price (133.94 FCFA and 160.35 FCFA for males and females respectively) which in turn increase males and females rice producer-marketers" profit. For Maize, the coefficient of price of transport (.08***) is positive and significant at 1% level of probability. This result is contrary to a priori expectation and implies a unit increase in the price of transport will increase the profit males maize youth producer-marketers by.08% . This could be explained by the high demand of maize associated with the poor rood network in the study area which could increase the selling price and thereby cover up all the transportation cost and increase females maize producer-

marketers' profit. The coefficient of gender dummy attached to price of transport is positive (.16) and not significant. The result implies that there is no gender difference in the price of transport among males and females maize youth producer-marketers.

However, the coefficients of price of fertilizer, gender dummy for fertilizer, price of herbicides and gender dummy for herbicides are not significant for males and females rice youth producer-marketers. This implies that they have no significant effect on the profit of males and females rice producer-marketers. Also, the coefficients of gender dummy for seed, price of fertilizer, gender dummy for fertilizer, gender dummy for selling price, gender dummy for price of transport, tax paid and gender dummy for tax paid are not significant for males and females maize producer-marketers. This implies that they have no significant effect on the profit of males and females Maize youth producer-marketers.

On the inefficiency model, household size, gender dummy for household size, distance to market and amount of credit received are the socioeconomic factors that significantly affect males and females Rice youth producer-marketers' profit inefficiency while age , gender dummy for age , gender dummy for experience, gender dummy for years in school, distance to market, gender dummy for distance to market, membership of association and gender dummy for membership are the socioeconomic factors that significantly affect males and females Maize youth producer-marketers' profit inefficiency.

Specifically, The coefficient of household size (.18***) is positive and significant at 1% level of probability. This result suggest that household size reduces males rice youth producer-marketers' profit efficiency. This result is consistent with the findings of Ogundari (2006) as cited in Saysay, 2016). He argued that larger households had the potential for providing cheaper farm labour, however they found that would have been used to purchase other farm inputs is often allocated to some other necessity like household consumption, hence the negative effect on overall efficiency (as cited in Saysay, 2016). In contrast, the coefficient of gender dummy attached to household size is negative(-.18**) and significant at 5% level of probability. This result is consistent with the a priori expectation and suggest that larger household size with females rice youth producer-marketers increases profit efficiency. This result is in line with the findings of Bocher and Simtowe (2016) who found a positive relationship between household size and profit efficiency of Groundnut farmers in Malawi. This result implies that there is gender difference in household size among males and females rice youth producer-marketers

which could be due to the bargaining power of women associated with less expenses in their total variable cost incurred in rice production marketing compare to the counterpart males (134,539.44 FCFA against 146,402.53 FCFA).

For males and females maize producer-marketers, the coefficients of age (.04**) and gender dummy attached to age (-.70**) are significant at 5% level of probability. These result are contrary with a priori expectation for males and in line for females. This result suggest that age decreases males rice youth producer-marketers' profit efficiency while age females increases rice youth producer-marketers' profit efficiency. The result also implies that there is gender difference on the effect of age on profit efficiency among males and females Maize youth producer-marketers which could be due to the fact that on the average females are younger than their counterpart males (32 years against 35 years) and could have more energy than males which could in turn lead to increase their profit efficiency.

Further, the coefficient for gender dummy for experience is positive (.39**) and significant at 5% level of probability. This result is contrary to a priori expectation. This result suggest that experience decreases females maize youth producer-marketers' profit efficiency. Also, the coefficient for gender dummy attached to education (.39**) is positive and significant at 5% level of probability. This result is contrary to a priori expectation. This result suggest that education decreases females maize youth producer-marketers' profit efficiency. This result implies that there is gender differences on the effect of education and experience on profit efficiency among males and females maize youth producer-marketers. This result could be explained by the fact that females heads have less education than their males counterparts in selected developing countries. It is suggested that females household heads in rural areas are disadvantaged with respect to human capital accumulation in most developing countries, regardless of region or level of economic development. This evidence reflects a history of bias against girls in education. Despite this bias, human capital accumulation is one asset category for which the gender gap has clearly narrowed in recent decades (World Bank, 2007; FAO, 2010). The coefficient of distance to market (-.17***) is negative and significant at 1% level probability. This result is contrary with the priori expectation. This result suggest that distance to market increases profit efficiency of males rice youth producer-marketers. This could explained by the fact majority of males rice farmers are full time (69.10% against 30.90% as part time)

farmers and are ready to cover as many distance as they can to sell their farm product. The gender dummy attached to distance to market (--.07) is negative but not significant. This result implies that there is no gender difference on the effect of distance to market among males and females Rice youth producer-marketers. For maize, the coefficient of distance to market (-.28***) is negative and significant at 1%. This result is in contrary with the a priori expectation and suggest that distance to market increases males Maize youth producer-marketers' profit efficiency. This result disagrees with the findings of Baht and Baker (2015) who found that distance to market decreased profit efficiency of smallholder Beef producers in Botswana. Similarly, the coefficient of gender dummy attached to distance to market (-.007***) is negative and significant at 1% level of probability. This result is contrary with the a priori expectation and suggest that distance to market increase females Maize youth producer-marketers' profit efficiency. This result implies that there is gender difference in the distance to market on males and females Maize youth producer-marketers' profit efficiency and could be explained by the average time spent by females to market (38.59 minutes) against their counterparts males (16.41 minutes). This result disagrees with the findings of Bocher and Simtowe (2016) who found a negative relationship between distance to market and profit efficiency of groundnut farmers in Malawi.

The coefficient for membership of association (.40***) is positive and significant at 1% level of probability. This result is contrary to with a priori expectation and suggest that membership of association decrease males maize farmers' profit efficiency. The coefficient of gender dummy attached to membership association (-.57**) is negative and significant at 5% level of probability. This result is in line with the a priori expectation and suggest that membership to association increases females Maize youth producer-marketers' profit efficiency. This could be explained by the fact that membership of association serve as mean to exchange ideas, experience and market information which could in turn increase females maize producer-marketers. This result implies that there is gender difference in the membership association among males and females maize youth producer-marketers' profit efficiency.

Finally, the coefficient of amount of credit received (1.82e-06 **) is positive and significant at 5% level of probability. This result is contrary to a priori expectation and suggest that credit received by males rice youth producer-marketers decreases profit efficiency. This result could be

explained by Koloma (2010) who opined that high transaction cost and administrative bottleneck in credit application, inadequate credit information, bank stringent conditions, location of lending institutions and bureaucratic processes in banks to late disbursement of loan facilities to farmers influences credit use on the supply side (cited in Oben, 2016). This result is contrary with the findings of Saysay et al. (2016) who found that farm credit can increase rice farming profit efficiency and reduce profit loss. Further, the coefficient of gender dummy for credit received (-.07) is negative and not significant. This result implies that there is no gender difference in the credit use among males and females Rice youth producer-marketers.

However, the coefficients of age gender dummy for age experience gender dummy for experience years in school gender dummy for years in school, gender dummy for distance to market, membership of association, gender dummy for membership, gender dummy for credit received are not significant for males and females rice producer-marketers while the coefficients of household size, gender dummy for household size, experience, years in school, amount of credit received and gender dummy for credit received are not significant for males and females Maize producer-marketers. Therefore, they have no significant effect on the profit efficiency among males and females rice and maize youth producer-marketers respectively.

Table 4: Effect of socioeconomic factors on profit efficiency among males and females Rice and Maize Producer-Marketers

Variables	Rice producer-marketers		Maize producer-marketers	
	Coefficient	t-ratio	Coefficient	t-ratio
Price of labour	.03***	4.98	.03***	2.75
Gender dummy for labour	.02**	2.12	-.08***	-3.89
Price of seed	.58***	10.48	.16***	3.49
Gender dummy for seed	-.61***	-5.57	.14	1.07
Price of fertilizer	.001	0.08	.01	0.45
Gender dummy for fertilizer	-.01	-0.80	.08	0.99
Price of herbicides	.003	0.40	.08***	2.84
Gender dummy for herbicides	-.01	-0.53	-.31**	-2.23
Selling price	.21**	2.20	1.37***	4.72
Gender dummy for selling price	.25***	3.40	.43	1.38
Price of transport	.15***	3.96	.08***	2.76
Gender dummy for price of transport	.35***	3.91	.16	1.16
Tax paid	.03***	4.38	.07	1.61
Gender dummy for tax paid	.04**	2.05	.03	0.39
Inefficiency model				
Age	-.16	-1.05	.04**	-2.47
Gender dummy for age	.30	1.33	-.70**	-2.52
Household size	.18***	3.51	-.20	0.07
Gender dummy for household size	-.18**	-1.96	.009	-0.88
Experience	-.04	-0.77	-.0006	-0.01
Gender dummy for experience	.01	0.16	.39**	2.29

Source: Field survey, 2018 ***,** and * are significant at 1%, 5% and 10% respectively

Table 4: Continued

Variables	Rice producer-marketers		Maize producer-marketers	
	Coefficient	t-ratio	Coefficient	t-ratio
Years in school	.01	0.44	-.0006	-0.88
Gender dummy for years in school	-.02	-0.43	.39**	-2.41
Distance to market	-.17***	-3.90	-.28***	-3.24
Gender dummy for distance to market	-.07	-0.71	-.007***	-0.05
Membership of association	-.05	-0.88	.40***	3.54
Gender dummy for membership	.07	0.60	-.57**	-2.38
Amount of credit received	1.82e-06 **	2.39	2.97e-06	1.45
Gender dummy for credit received	-.07	-0.77	-.0000167	-2.12
Constant	-1.25e-06	7.67	2.80	1.90
Usigma_cons	-1.10	-7.14	-.36	-2.56
Vsigma_cons	-2.82	-11.63	-1.11	-8.58
sigma_u	.57	12.88	.83	14.22
sigma_v	.24***	8.25	.57***	15.41
Lambda	2.35***	35.33	1.45***	17.42
Log likelihood	-341.0337		-804.06	

Source: Field survey, 2018 ***,** and * are significant at 1%, 5% and 10% respectively

Profit Efficiency Estimate of males and females Rice and Maize youth producer-marketers

The profit efficiency estimates of males and females Rice and Maize youth producer-marketers is presented in table 5. Results show that males and females Rice youth producer-marketers' profit efficiency ranges between 0.03 to 0.93 with an average and standard deviation of 0.63 and 0.22 respectively while profit efficiency of males and females Maize youth producer-marketers ranges between 7.16e-06 and 0.89 with average and standard deviation of .55 and .20 respectively. This implies that profit efficiency of males and females Rice and Maize youth producer-marketers could be increased by 0.37% and 0.45% respectively if the available resources are efficiently utilized given the market price of the various inputs use. The average level of profit efficiency could be due to various agricultural targeted programmes set up in Cameroon for the sustainability of smallholders farmers. These results are below the findings of Rahman (2003) who found profit efficiency of 0.71 for Rice farmers in Bangladesh. Specifically, 5.6% of males and females Rice youth producer-marketers have profit efficiency estimates of less than 0.2; 6.1% have profit efficiency estimates ranging from 0.2 to 0.3; 8.2% have profit efficiency estimates ranging from 0.31 to 0.41; 7% have profit efficiency estimates ranging from 0.42 to 0.52; 14.3% have profit efficiency estimate ranging from 0.53 to 0.63; 16.6% have profit efficiency estimates ranging from 0.64 to 0.74%; 30.8% have profit efficiency estimates ranging from 0.75 to 0.85 and 11.4% have profit efficiency estimates above 0.85 while 11.2% of males and females Maize youth producer-marketers have profit efficiency estimates of less than 0.2; 4.7% have profit efficiency estimates ranging from 0.2 to 0.3; 7.6% have profit efficiency estimates ranging from 0.31 to 0.41; 10.5% have profit efficiency estimates ranging from 0.42 to 0.52; 22% have profit efficiency estimates ranging from 0.53 to 0.63; 33.3% have profit efficiency estimates ranging from 0.64 to 0.74%; 9.6% have profit efficiency estimates ranging from 0.75 to 0.85 and 1% have profit efficiency estimates above 0.85.

Table 5: Profit Efficiency Estimates for Males and Females Rice and Maize youth Producer-Marketers

Profit Efficiency estimates	Rice youth producer-marketers		Maize youth producer-marketers	
	Frequency	percentage	Frequency	Percentage
<0.2	24	5.6	66	11.2
0.2-0.3	26	6.1	28	4.7
0.31-0.41	35	8.2	45	7.6
0.42-0.52	30	7.0	62	10.5
0.53-0.63	61	14.3	130	22.0
0.64-0.74	71	16.6	197	33.3
0.75-0.85	132	30.8	57	9.6
>0.85	49	11.4	6	1.0
Total	**428**	**100**	**591**	**100**
Mean	.63		.55	
Minimum	.03		7.16e-06	
Maximum	.93		.89	
Standard deviation	.22		.20	

Conclusion

For the past decade, food and agriculture organization (FAO) have prioritized and recognized the role play by women in the agricultural sector due to their contributions in terms of workforce and daily survival of the family. Despite such attention women are yet to be given the same opportunity than the counterparts males in term of access to productive resources such as land, agrochemicals, improved seed varieties, credit and so on. In this study, an updated empirical evidence using cross section data is used to validate whether there is a difference in profit efficiency among males and females youth producer-marketers in the marketing of Rice and Maize in Cameroon. The results show that price of labour, selling price, tax paid and price of transportation positively affect profit of males and females youth involved in rice marketing while price of seed negatively affect females rice youth producer-marketers. The study also shows that price of labour and price of herbicides negatively affect females involved in maize marketing while price of labour, price of seed, price of herbicides, selling price and price of transport positively affect profit of males youth producer-marketers involved in maize marketing. Further, household size and distance to market are the factors that positively and significantly affect females rice youth producer-marketers' profit efficiency while household size and amount of credit use negatively and significantly affect males rice youth producer-marketers' profit efficiency. Also, results show that age, membership to association negatively and significantly affect males maize youth producer-marketers' profit efficiency while distance to market positively affect males maize youth producer-marketers' profit efficiency. Experience and years in school negatively and significantly affect females maize youth producer-marketers' profit efficiency while age, distance to market and membership of association positively and significantly affect females maize youth producer-marketers' profit efficiency. Further, the study show that males and females rice and maize youth producer-marketers operates below the full profit efficiency level.

Recommendations

Based on the aforementioned conclusions the following are recommended:

i. Given that price of labour significantly reduce females maize and rice youth producer-marketers' profit. It is suggested that females rice and maize youth producer-marketers

should be encourage to register into proactive association for mutual help in farm labour which could in turn considerably reduce price of labour and increase their profitability.

ii. More road network should be maintained and constructed given that transportation cost and distance to market reduce considerably females rice and maize youth producer-marketers' profit.

iii. Since amount of credit received significantly affect males and females youth rice producer-marketers, loans without interest rate and training on use of credit should given to farmers given the smallholding nature of their farms.

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