Household Resources Allocation, Gender, and Economic Performance: Empirical Evidence from Senegal, West Africa

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Abstract

This paper has examined Pareto efficiency of household resources allocation and the appropriateness to use gender-specific models rather than unitary model while investigating economic performance of men and women managers of separate plots within horticultural households in Senegal, West Africa. This paper contributes to the gender and economics literature providing empirical evidence of intra-household resources allocation in a specific social, economic and cultural context in which polygamy occurs and where husband and wives manage separately their plots.

The findings confirm the suitability of gender-specific models to shed light on the gender differential of performance. As the subject matter is efficiency, as well in econometric as in economic point of views, the findings provide evidence that there is gain in efficiency using gender-specific models rather than unitary model to illuminate the gender difference.

From the findings can be concluded that Pareto optimum corresponding to the situation of allocative efficiency, is far from to be achieved by horticultural households. Some Pareto improvements can be made between men and women’s plots. The gender-specific models showed that women are less technically efficient than men. This suggested some policy implications more gender sensitive to improve men and women ability to manage more efficiently their productive resources.

Key words: Household Resources Allocation, Gender, Economic Performance, Horticulture, Senegal

JEL Codes: D2
1. Introduction

The economics of intra-household allocation of resources has undergone substantial changes over the last decades. After the introduction by Nobel Laureate Gary Becker of the New Household Economics in which he distinguished activities within the household from those outside the household, the approach has changed considerably. While Becker maintained a single objective function for the household, later analyses (McElroy and Horney, 1981; Manser and Brown, 1980) considered the households as collective decision making units. A decision of this unit was seen as the result of bargaining between individual household members and the unitary household model would result only as a special case (Alderman et al., 1995). The collective decision model rightly predicted that individual consumption not just depends on the collective income, but also on his or her own contribution to this income.

More recent studies, such as those by Chiappori (1997) did no longer focus on the distribution of power in the household but on the Pareto efficiency of the allocation. In many applications, the allocation of resources in these models came out as efficient, even though income pooling would be rejected (Fafchamps, 1998). A model that related to production efficiency within the household is that of Udry (1996). He showed that yields of plots under the control of women, and of young adults in Burkinabe rural households, were substantially lower than those of the plots of the (male) head of the household. These results cast doubt on both the collective and the unitary model of the farm household, at least where efficiency is concerned.

The objective of this paper is to examine the distribution of resources within horticultural households in Senegal and to test the efficiency of this distribution. With the gender disaggregated data collected from 422 plots managers distributed in 202 households located in 30 villages in the Zone of Niayes, this paper also aims at showing the extent to which economic performance of the wives deviated from that of the husband head of household. To come up to this objective requires gender-specific economic models to be applied to the horticultural households. Doing so, this paper provides key evidence contributing to the rejection of the unitary model illustrating its weaknesses.

As mentioned by Quisumbing (2003) “Despite evidence rejecting the unitary model, the body of research from which generalizations can be drawn is limited. Few studies have been replicated over a range of conditions and cultures (Haddad, Hoddinott, and Alderman 1997). Other factors besides policy clearly affect intrahousehold allocation, such as the extended family, community, and other social groups. More important, existing empirical work in economics may not adequately capture the specific cultural contexts in which individuals within households and families make decisions.”

After a review of the literature, this paper proceeds to the measurement of economic performance of men and women plots managers using indicator such as technical and allocative efficiency to capture and explain the gender differential. Based on the results, a conclusion and policy implications were drawn.
2. Literature review

2.1. Economics of household resources allocation and gender

Intra-household resources allocation refers to the processes by which resources are distributed among individual household members and the outcomes of those processes (Quisumbing, 2003). According to the “New Household Economics” (NHE), household can be considered as a unit maximising the joint utility of its different members. This approach named “unitary household model” is based on the assumptions that all household resources are pooled and all expenditures are made out of pooled income (Haddad et al, 1994).

Much policy analysis was based on Becker’s approach which assumes that the household has a single set of preferences, represented by a household utility function (Haddad et al, 1994). The household unitary model has been the dominant model used by neoclassical economists as a theoretical and empirical tool in the examination of intra-household resources allocation (Akram-Lodhi, 1997). However, despite its predictive power and its relative simplicity, unitary household models have been criticised by different authors (Bardhan and Udry, 1999; Udry, 1996; Haddad et al, 1994; Akram-Lodhi, 1997; Fafchamps, 1998 …) due to several weaknesses. Equating the household with one person, household economic theory carries a gender bias confusing the individual taking the decision and orchestrating the strategy as implicitly the man (Niehof, 1999; Akram-Lodhi, 1997).

Numerous policy levers normally able to address development problems did not provide the expected impacts because disabled by the assumption that household acts as one (Quisimbing, 2003). Many development projects and programs were concentrated on man head of household, presuming that he would distribute development benefits within the household unit. Within the past decades, studies have demonstrated not only that individuals within a household make decisions to maximize their individual goals but also, that these goals may even be antithetical to those asserted for the household as a unified entity (Henderson, 1995). In order to understand these social relations of gender subordination, it is required to move beyond unitary models and into the household itself, by examining the ways in which relative power is socially constructed and expressed (Akram-Lodhi, 1997).

The NHE unitary approach lacks a gender perspective. Other alternative models called “collective models” have been developed and used by neo-classical economists (Manser and Brown, 1980; McElroy and Horney, 1981 …) to analyse intra-household resources allocation. The collective models can be divided into cooperative and non cooperative models, and bargaining models (Haddad et al, 1994). However, even if the non-cooperative models can be considered more convenient than the cooperatives ones, they still have some limits to figure out the inequality in terms of resources allocation and power in the decision making process. These inequalities may be revealed by conflict and consensus within the household (Akram-Lodhi, 2005) and can be analysed with the bargaining models.

Evidently, farm households need to survive by fulfilling certain fundamental basic needs. However, in fulfilling those needs, household members may in many instances attempt to make separate decisions concerning the use of gender-specific decisions and gender-specific production functions in pursuit of gender-specific preferences. It would be better to say that the farm household would not have a single production function, rather gender-specific production functions (Evans, 1991, Akram-Lodhi, 1997).
The scientific contribution of the research lies in admitting this assertion and using then, gender-specific production functions and broadly, gender-specific economic models to test the Pareto efficiency of the household resources allocation between men and women plots managers while analyzing their economic performance.

2.2. Women and microeconomic performance analysis

The microeconomic performance of women farmers in the agricultural sector of developing countries is subject of passionate debate. However, few studies have dealt with this issue in African agriculture (Adesina and Djato, 1996; Udry, 1996). These studies have found that, where women and men farmers manage separate plots, as in many African farming systems, plots farmed by women have lower yields than those farmed by men. According to the studies examining the technical efficiency of male and female farmers, this is a result of lower levels of input use on women’s plots, and not to inherent managerial differences between men and women farmers (Adesina and Djato, 1996, Udry, 1996). As illustration, studies carried out in Kenya, Thailand and Korea, show that, controlling for education, age and levels of land, labour, fertilizer and other inputs, female farmers are as efficient as male farmers (Quisumbing et al, 1998; see also Deere et al, 2004 for Latin America). Yet as mentioned above, the distribution of resources within the household may be such that the household as a whole is inefficient (Udry, 1996).

This study contributed by elaborating gender-specific models to shed light on the difference in terms of efficiency between men and women managers of separated plots within horticultural households.

3. Gendering efficiency modelling

The stochastic frontier production function for cross-section or panel data proposed by Battese and Coelli (1995) was used. The difference will be in addition to the unitary stochastic frontier model, gender-specific stochastic frontier models were used to better capture the gender difference. The models can be specified as follows:

\[ Q_{hijct} = f(X_{hijct} \beta)e^{(V_{hijct} - U_{hijct})} \]  

(1)

Where:
- \( Q_{hijct} \) is output in value per hectare obtained in household \( h \), for crop \( c \in \{ \text{onion, cabbage, tomato, potato, green bean} \} \), on plot \( i = 1, 2, \ldots n \), managed by plot manager \( j \) who is man or woman household member \( j \in \{ m, w \} \), at season \( t \in \{ 1^{st} \text{ season}, 2^{nd} \text{ season}, 3^{rd} \text{ season} \} \),
- \( X_{hijct} \) is a \( (1 \times k) \) vector inputs used on plot \( i \),
- \( \beta \) is a \( (k \times 1) \) vector of parameters to be estimated,
- \( V_{hijct} \) is the random error term assumed to be independently and identically distributed (IID) \( N(0, \sigma_v^2) \),
- \( U_{hijct} \) is referred to as inefficiency term assumed to have a strictly non-negative distribution, and obtained from a truncation at zero of the normal distribution \( N(Z_{hijct}, \sigma^2) \) where \( Z_{hijct} \) is a \( (1 \times m) \) vector of plot or plot manager specific inefficiency variables and \( \lambda \) is a \( (m \times 1) \) vector of coefficients associated to be estimated.

Doing so, the inefficiency component \( U_{hijct} \) can be modelled as follows:

\[ U_{hijct} = Z_{hijct} \lambda + \varepsilon_{hijct}, \quad \varepsilon_{hijct} \sim N(0, \sigma^2) \]  

(2)

5
Technical efficiency of production of plot i, with crop c and manager j ∈ {m, w} can be specified as:

\[ TE_{ijct} = e^{-U_{ijct}} = e^{-z_{ijct} X - e_{ijct}} \]  \hspace{1cm} (3)

Pareto efficiency of allocation of resources within household holds if values of marginal product (VMP) of inputs X used on plot i managed by men are equal to those on similar plot i managed by women. In other words, whatever the gender of the plot manager j (j ∈ {m, w}) within household, the value of marginal products of each input should be the same and equal to the price.

\[ VMP(X_{ijct}) = \frac{\partial Q_{ijct}}{\partial X_{ijct}} = P_{ijct} \]

4. Empirical analysis: functional forms and variables

Udry (1996) found that the variation in output was function only of variation in plot characteristics. Contrary, in this study the results of the data analysis show that the gender variation in output is function of input used such as seed, fertilizers and pesticides, labour (household labour and hired labour) and irrigation equipment (table xx). There is no major gender difference regarding physical conditions of the plots, the gap is only relative to plot area and land ownership.

To avoid multicollinearity between variables, aggregated variables were used. The stochastic frontier production function estimated was specified as following:

\[ \log(Q_{ijct}) = \beta_0 + \beta_1 \log(Plot_{ijct}) + \beta_2 \log(Labh_{ijct}) + \beta_3 \log(Labo_{ijct}) + \beta_4 \log(Input_{ijct}) + \beta_5 \log(Irreq_{ijct}) + \beta_6 Seas + V_{ijct} - U_{ijct} \]  \hspace{1cm} (4)

Where dependent variable logarithm output in value per hectare (Q_{ijct}) is a function of logarithms of:

- Plot_{ijct}, plot area cultivated in hectare,
- Labh_{ijct}, aggregated working time of household members (plot manager, spouses, sons, daughters and others) in hours per hectare,
- Labo_{ijct}, aggregated time of hired labour (sharecroppers, male and female temporary labour, wage labour) in hours per hectare,
- Input_{ijct}, aggregated cost of other inputs used (seed, pesticides, mineral and organic fertilizers) in fcfa per hectare,
- Irreq_{ijct}, aggregated cost of irrigation equipment used on the plot (motorized pump, wells, drip systems, sprinklers, seals, ropes, pulleys, ...) in fcfa ,
- Seas, horticultural season (1\textsuperscript{st} season, 2\textsuperscript{nd} season, 3\textsuperscript{rd} season).

Table xx: Gender comparison of the means of the variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Men and Women</th>
<th>Men</th>
<th>Women</th>
<th>Two-sample t test (H0: Men-Women=0): t-statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q (fcfa/ha)</td>
<td>4,159,506</td>
<td>3,964,871</td>
<td>4,656,523</td>
<td>-2.15***</td>
</tr>
<tr>
<td>Plot (ha)</td>
<td>0.17</td>
<td>0.22</td>
<td>0.05</td>
<td>7.57***</td>
</tr>
<tr>
<td>Labh (hr/ha)</td>
<td>14,472</td>
<td>7,292</td>
<td>32,550</td>
<td>-10.64***</td>
</tr>
<tr>
<td>Labo (hr/ha)</td>
<td>2,239</td>
<td>2,509</td>
<td>1,513</td>
<td>1.92**</td>
</tr>
<tr>
<td>Input (fcfa/ha)</td>
<td>608,661</td>
<td>562,747</td>
<td>732,710</td>
<td>-3.29***</td>
</tr>
<tr>
<td>Irreq (fcfa)</td>
<td>374,763</td>
<td>487,729</td>
<td>89,849</td>
<td>6.76***</td>
</tr>
</tbody>
</table>

***, ** significant at the 1% and 5% level respectively.
The model was estimated three times. In effect, to shed light on the gender difference as suggested by feminist development economics theory (Akram-Lodhi, 2005), instead using gender as an explanatory variable, in addition to unitary stochastic frontier production function (for \( j = \text{men or women} \)), gender-specific stochastic frontier production functions (for \( j = \text{men} \) and for \( j = \text{women} \)) were estimated.

Allocative efficiency of resources within household is examined through the comparison of the value of the marginal product of inputs on men and women’s plots. As the production function estimated is log-linear, the coefficients correspond to the elasticity:

\[
\beta = \frac{\partial \ln Q_{hijt}}{\partial \ln X_{hijt}} = \frac{\partial Q_{hijt}}{\partial X_{hijt}} / X_{hijt}
\]

So:

\[
VMP(X_{hijt}) = \frac{\partial Q_{hijt}}{\partial X_{hijt}} = \beta \frac{Q_{hijt}}{X_{hijt}}
\]

5. Empirical results and discussion

5.1. Estimation of unitary and gender-specific stochastic frontier production functions

Maximum Likelihood (ML) of the Frontier program of Stata for cross-sectional and panel data was used to estimate the parameters. As can be read from table 1, as expected the \( \beta \) coefficients are all positive except for aggregated irrigation equipment cost in the unitary and men-specific stochastic frontier production functions. Contrary, in women-specific stochastic frontier production function, all the \( \beta \) coefficients are positive showing a priori a great difference between the models and the reject of Pareto efficiency of the resources allocation within household.

The unitary model shows that variables cost of inputs (seed, mineral and organic fertilizers, and pesticides), household labour, hired labour and horticultural season are statistically significant at least at the 5% level. From the analysis of the estimates can be deduced that output in value per hectare for both men and women plots managers depends more on cost of inputs (\( \beta_2 = 0.349 \)) than on horticultural season (\( \beta_6 = 0.119 \)), household labour (\( \beta_3 = 0.095 \)) and hired labour working time (\( \beta_4 = 0.085 \)). This result is similar to Audibert (1997) findings in Mali, but is contradictory to findings by Seidu (2008) in Ghana, Battese and Coelli (1995) but for rice production instead of horticultural production. Plot area cropped and irrigation equipment cost used by men and women plots managers are not significant even at the 10% level. These results are similar to Seidu (2008) results but in contrast with Audibert (1997). The effect of the season is significant at the 5% level. This implies a technical change indicated by a shift in the level of the frontier over the seasons due to an increase of output price.

Considering men-specific stochastic frontier production function, the coefficients of the variables show same direction and signs but differ in terms of magnitude and significance compared to the unitary model. Consequently, the analysis of the effects of variables leads to the same conclusion as the unitary model. Output in value per hectare obtained by men plots managers from their plots is significantly (from the 0.1% to 5% levels) determined mostly by the cost of inputs (\( \beta_2 = 0.461 \)) and horticultural season (\( \beta_6 = 0.144 \)) than household labour (\( \beta_3 = 0.103 \)) and hired labour working time (\( \beta_4 = 0.097 \)). Plot area cropped by men and cost of irrigation equipment remain not significant even at the 10% level.
Regarding women-specific frontier production function, contrary to the unitary and men-specific models, only household labour working time ($\beta_3=0.153$), irrigation equipment cost ($\beta_5=0.170$) and horticultural season ($\beta_6=0.208$) have significant effect at least at the 10% level on output in value per hectare. Cost of inputs, hired labour working time and plot area are not significant even at the 10% level. Obviously, women-specific stochastic production function differs greatly from men-specific model as well as the unitary model as can be read from table 1.

Estimate $\gamma$ which is the variance of plot manager-specific technical inefficiency over the total variance of output ($\gamma = \sigma_u^2/\sigma^2$) is 0.97 for the unitary model, 0.99 for men-specific model and 0.54 for women-specific model. This means that according to unitary model, 97% of the variation in output in value per hectare among men and women plots managers is due to the difference in technical inefficiency. Meanwhile, the gender-specific models show that 99% of the variation in output in value per hectare among men plots managers result from technical inefficiency against 54% among women plots managers. Consequently, the variance of the technical inefficiency effects is higher among men plots managers than women plots managers. It results that among men plots managers, only 1% of the variation in output in value per hectare is due to random shocks whereas among women it is 46%. Then, the effects of the random shocks are much higher among women than men plots managers. These random socks are beyond their control and are mainly plant diseases, parasites infestation, locust invasion, floods during the rainy season, output market price …

Table 1: Estimates of the parameters of the unitary and gender-specific stochastic frontier production functions

<table>
<thead>
<tr>
<th>Dependent variable log(Q)</th>
<th>Unitary stochastic frontier production function</th>
<th>Men-specific stochastic frontier production function</th>
<th>Women-specific stochastic frontier production function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
<td>Std. Err.</td>
<td>z-value</td>
</tr>
<tr>
<td>Log(Plot)</td>
<td>0.005</td>
<td>0.065</td>
<td>0.09</td>
</tr>
<tr>
<td>Log(Input)</td>
<td>0.349</td>
<td>0.069</td>
<td>4.99***</td>
</tr>
<tr>
<td>Log(Labh)</td>
<td>0.095</td>
<td>0.043</td>
<td>2.19**</td>
</tr>
<tr>
<td>Log(Labo)</td>
<td>0.085</td>
<td>0.027</td>
<td>3.16***</td>
</tr>
<tr>
<td>Log(Irreq)</td>
<td>-0.010</td>
<td>0.043</td>
<td>-0.24</td>
</tr>
<tr>
<td>Seas</td>
<td>0.119</td>
<td>0.058</td>
<td>2.05**</td>
</tr>
<tr>
<td>Constant</td>
<td>9.384</td>
<td>1.051</td>
<td>8.92***</td>
</tr>
<tr>
<td>$\sigma^2$</td>
<td>10.06</td>
<td>61.03</td>
<td>0.77</td>
</tr>
<tr>
<td>$\gamma = \sigma_u^2/\sigma^2$</td>
<td>0.971</td>
<td>0.173</td>
<td>0.998</td>
</tr>
<tr>
<td>$\sigma_\gamma^2$</td>
<td>9.775</td>
<td>61.03</td>
<td>0.775</td>
</tr>
<tr>
<td>$\sigma_v^2$</td>
<td>0.287</td>
<td>0.030</td>
<td>0.331</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-276.9</td>
<td>-221.60</td>
<td>-40.33</td>
</tr>
<tr>
<td>Number obs.</td>
<td>294</td>
<td>159</td>
<td>221</td>
</tr>
<tr>
<td>Number group</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

***, **, * significant at the 1%, 5% and 10% levels respectively.

To compare the estimates of the parameters of the unitary and gender-specific models, the following likelihood ratio test was done:

Ho: Estimates are same for both unitary model and gender specific-models

$\lambda = -2 \log \text{likelihood unitary model} - (\log \text{likelihood men-specific model} + \log \text{likelihood women-specific model})$
\[ \lambda = -2[-276.94 - (-221.60 - 40.33)] \]
\[ \lambda = 30.02 > 12.02 \text{ (critical value of chi-squared with 7 degrees of freedom at the 10\% level)} \]

Therefore, Ho is rejected. The likelihood ratio test shows that the estimates of the unitary and gender-specific models are not the same. In addition, in econometric point of view is there a gain estimating the unitary model rather than the two gender specific-models? The sum of log likelihood of the gender-specific models is greater (closer to zero) than the log likelihood of the unitary model \((-221.60 - 40.33 = -261.93 > -276.94\) showing there is an efficiency gain estimating the gender-specific models rather than the unitary model.

It will be wrong or biased to use the unitary frontier production function to pretend to study the gender differential. “The household would not have a single production function, but rather gender-specific production functions, suggesting that the household production function cannot be solved because it does not exist.” (Akram-Lodhi, 2005).

5.2. Technical efficiency scores and its distribution across gender

From the unitary stochastic frontier production function, the overall mean technical efficiency is estimated to 0.77 for both men and women with a minimum of 0.16 and a maximum of 0.90. So, some plots managers have very low technical efficiency and none of the plots managers have reached the frontier level, in other words, none of them is fully technically efficient. A gender disaggregation of the technical efficiency predicted from the unitary model gives an average technical efficiency index of 0.76 for men and 0.78 for women plots managers. Consequently, based on unitary model, women exhibit higher technical efficiency than men and the difference is 0.02 and is significant at the 10\% level. These results are in contrast with those derived from gender-specific models.

Men-specific stochastic frontier production function indicates an average technical efficiency of 0.78 with a minimum of 0.22 and a maximum of 0.88 for men plots managers. Based on women-specific stochastic frontier production function, women technical efficiency index ranges from 0.25 to 0.86 with an average of 0.65. Contrary to unitary model predictions, gender-specific models show that women are less technically efficient than men. The two sample t-test done shows that the difference is significantly different from zero at the 1\% level. Table 2 presents the efficiency scores.
Table 2: Gender comparison of technical efficiency scores using unitary and gender-specific stochastic frontier production functions

<table>
<thead>
<tr>
<th>Stochastic frontier production functions</th>
<th>Gender group</th>
<th>Technical efficiency (TE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unitary model</td>
<td>Men</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>0.78</td>
</tr>
<tr>
<td></td>
<td>Men and Women</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>Difference (men TE – women TE)</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

|                   | t Pr (|T| > |t|) | -1.65 (H0: Men TE – Women TE = 0) | 0.09 |

|                   | t Pr (|T| > |t|) | 9.45 | 0.000 |

Men-specific model | Men               | 0.78 | 0.006 | 0.110 | 0.22  | 0.88  | 308 |
|                   | Women             | 0.65 | 0.015 | 0.161 | 0.25  | 0.86  | 114 |

Women-specific model | Difference (men TE – women TE) | 0.13 | 0.013 |

Two-sample t test | t Pr (|T| > |t|) | 9.45 | 0.000 |

5.3. Gender and efficiency of allocation of resources within household

Based on gender-specific models, the value of marginal product of land, inputs, labour and irrigation equipment differs from men to women’s plots within household as shown by table 3. It would be better to say that a change in inputs leads to a change in output which differs from men to women’s plots. The differences are statistically different from zero at the 10% level. The value of marginal product of land, inputs, household labour and hired wage labour is higher on men’s plots than on women’s one as shown by the ratios which are greater than one. Contrary, the value of marginal product of irrigation equipment is higher on women’s plots than on men’s one where it is negative. While within household, land, labour and others inputs are better valued on men’s plots, irrigation equipment is more valued on women’s plots as can be read on table 3.

Table 3: Gender comparison of Value of Marginal Product of inputs within household

<table>
<thead>
<tr>
<th>Variables</th>
<th>Unitary price</th>
<th>Value of Marginal Product (VMP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men-specific model: VMPM</td>
<td>Women-specific model: VMPW</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev. Within household</td>
</tr>
<tr>
<td>Land (fcfa/ha)</td>
<td>200,000</td>
<td>1,550,264</td>
</tr>
<tr>
<td>Inputs</td>
<td>1</td>
<td>2.31</td>
</tr>
<tr>
<td>Household labour (fcfa/hr)</td>
<td>142-285</td>
<td>344</td>
</tr>
<tr>
<td>Hired wage labour (fcfa/hr)</td>
<td>142-285</td>
<td>293</td>
</tr>
<tr>
<td>Capital irrigation equipment</td>
<td>1</td>
<td>-0.55</td>
</tr>
</tbody>
</table>
Consequently, from the analysis of the value of the marginal products can be conclude that Pareto optimality which corresponds to the situation under which allocative efficiency occurs, is far from to be achieved within households. Some Pareto improvements can be made in the allocation of land, inputs, labour and capital irrigation equipment between men and women’s plots taking into account the value of marginal products. This result corroborates in another way findings by Udry (1996) and Alderman et al (1995) but using a step furthermore comparing the value of marginal products of factors of production.

Furthermore, beyond intra-household, allocative efficiency reflects the aptitude of men and women plots managers to combine inputs profitably in such a way to equalize the value of marginal products of inputs to their unit prices. Accordingly, neither men nor women plots managers did achieve absolute allocative efficiency for all inputs as can be read from table 3.

5. Conclusion

This paper has examined the Pareto efficiency of household resources allocation and the appropriateness to use gender-specific models rather than unitary model while investigating economic performance of men and women plots managers within horticultural households in Senegal. This paper contributes to the gender and economics literature providing empirical evidence of intra-household resources allocation in a specific social and cultural context in which polygamy occurs and where the husband and his wives manage separately their plots.

The results derived from unitary model differ much more from those derived from gender-specific models. The findings confirm the rejection of the unitary model and the suitability of gender-specific models to shed light on the gender differential of performance. Definitively, as the subject matter is efficiency, as well in econometric as in economic point of views, the findings provide evidence that there is gain in efficiency using gender-specific models rather than unitary model to shed light on the gender difference between plots managers.

From the findings can be conclude that Pareto optimum corresponding to the situation of economic efficiency, is far from to be achieved by horticultural households. In the allocation of land, household labour and other input, for instance, some Pareto improvements can be made between men and women plots.

In terms of policy implications, in spite of horticultural households have accumulated rich experience, they are still not fully technically efficient. Efforts need to be developed by policy makers to provide to horticultural households a suitable support to improve their ability to manage more efficiently their productive resources. This requires research institutes and extension services to be more operational working closely with the horticultural households. An improvement of the technology of production through a sustainable system of credit which can allow households to modernize their production will be useful. For instance, making accessible the use of improved irrigation equipment will lead to an increase of the scale of production with a positive effect on the productivity and efficiency. However, the policy should be gender sensitive taking into account the specific problems of women plots managers. A better access to land, to improved irrigation equipment and an alleviation of their daily domestic tasks will be a lever to reduce the gender gap and to improve women economic performance and consequently, their well-being and the whole household welfare.
References