

# **A Characterization of Horticultural Households from a Gender Perspective: Elaborative Description of Data**

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## 1. Introduction

For any study centred on the household, it is greatly important to get insight into the household itself to find out its main social, demographic and economic characteristics, before proceeding to any other type of analysis. For this reason, this paper which is part of my PhD thesis entitled “*Economics of Gender, Risk and Labour in Horticultural Households in Senegal*” gives a characterization of horticultural households located in the Niayes Zone of Senegal in West Africa. This characterization will be given from a gender standpoint, in other words, using a disaggregation into men and women of all the data collected from a survey of 203 horticultural households.

A horticultural household is defined as a group of people or a family-based community composed of a head (usually a man and sometimes a woman), wives and children as well as extended relatives, living together in a unit of residence, sharing their meals, cultivating mostly horticultural crops on their land jointly or separately, and/or doing other work with as overall objective the welfare and secured livelihood of its members.

Accordingly, this paper first focuses on:

- i. the social and demographic characteristics of horticultural households in section 1.1;
- ii. the economic characteristics with a particular focus on horticultural household resource and assets endowment in section 1.2;
- iii. gender and bargaining within the horticultural household in section 1.3;
- iv. and finally, estimating the horticultural household income in section 1.4.

Secondly, after this global characterization of horticultural households, this paper intends to shed light on the gender distribution of household resources between husband and wives or, more globally, men and women managers of separate plots within the household. Getting inside the horticultural household, this second part of the paper identifies the horticultural plots and crops sampled (sections 2.1 and 2.2), describes the issues linked to the physical conditions of men and women’s plots (section 2.3). This is followed by an evaluation of the inputs used by men and women plot managers (section 2.4), the output (section 2.5), the seasonal effects (section 2.6), and the profitability.

Thus, this paper gives an elaborate description of the data, providing enough background of the horticultural households for the analysis of their economic performance in other following papers.

## **2. A characterization of horticultural households**

### **2.1. Social and demographic characteristics of horticultural households**

#### **Horticultural households' headship, gender and age**

A total of 203 horticultural households were surveyed in the Niayes Zone. Among them, 190 are headed by men and only 13 by women (6.4%). These female heads of household are mainly widows (10 out of 13) with often young children, or married women with a husband permanently migrated inside the country, particularly to Dakar, the capital city of Senegal, or to foreign countries like Europe. The widowed women become head of household, managing all the resources; they are responsible for the family needs. The women whose husbands have migrated permanently, coming back home for only a short time, are in a similar position.

In terms of age, households' heads show a large diversity. The youngest household head is 21 years old and the oldest one is 84. This denotes that some heads are very young and some others rather old. On average, the age of a household head is about 51 years. Most of the household heads are in their forties and sixties. There is no major age difference between male and female heads of horticultural households.

#### **Household kinship composition and size**

In terms of kinship, a horticultural household is commonly composed of a husband who is the head, wives, sons, daughters, and other extended relatives. The marital status of horticultural household heads shows that polygamy is widely practised. The number of wives ranges from 1 to 4. Among the 190 male heads of household, 43% are monogamous and 57% are polygamous. In greater detail, 35% of the heads of household have 2 wives, 18% have 3 wives, and 4% have 4 wives. The wives share the same house.

Obviously, the polygamous status of most horticultural household heads impacts on the number of their children. Household offspring varies from 0 to 21 persons, with an average of 6. It is

important to note that only the children who are living with the household head or who have emigrated but still belong to the household are accounted for. The children who are married and/or living outside the household are not taken into account. Moreover, as is usual in African countries, in addition to wives and children, the household accommodates other extended relatives of the household head, such as a mother, father, brother, sister, aunt, niece, nephew, cousin, grandson, granddaughter, sister-in-law, brother-in-law... The number of extended relatives varies greatly from one household to another, from 0 to 12, with an average of 1.5. Half of the households have no extended relative living in.

In total, the household size varies greatly. The smallest household houses 3 members and the largest one 26 members. On average, a household counts about 10 members, which can be decomposed in terms of kinship as shown in table 2.1.

## **Household education**

### ***Household heads education***

The majority of household heads (74%) has attended a Koran school named “Daara” in Woloff (the local language) for several years when they were young, learning the Holy Koran. For this reason, some of them can still read or write in Arabic, while others lose these abilities over the years. In terms of formal education, the schooling rate of heads of household is very low. Among 202 household heads, only 17 heads have just attended primary school, 9 have made it to secondary school and only one has reached university level. About 24 of the 202 household heads have not mastered any form of literacy. However, if only formal education is taken into account, 175 household heads are illiterate and 27 are literate. This is equivalent to an illiteracy rate of 87% for household heads, as can be read from table 2.1.

### ***Household members' education***

Regarding other household members, on average 5 members have attended Koran school, while 3 have attended primary school over an average household size of 11 members. This is equivalent to a rate of Koran school attendance of 45% and a rate of primary schooling of 30%. As to secondary education and/or university or superior education, very few household members have

reached this level. Eighty percent and 97% of the households have zero members who attained a secondary education or a university degree, respectively. A gender disaggregation of the data shows that 49% of the households have 0% as female primary schooling rate, while 89.5% of the households have 0% as female secondary schooling rate.

In conclusion, the results show low rates of schooling and also a small gender gap. Nevertheless, these results are better than in most rural areas. The horticultural villages are generally relatively large and are located in the proximity of the big cities and roads. Consequently, most of them have primary schools. However, the absence of secondary schools is a constraint. They are obliged to go to cities and this is not easy for some households because of the loss of labour and costs involved.

However, it is important to note that tremendous efforts have been made by the Senegalese authorities to increase the schooling rate, particularly for girls, through awareness campaigns, building schools, and increasing the number of teachers. As a result, the national primary schooling rate, which was about 75% in 2003, amounting to 79% for boys and 72% for girls<sup>1</sup>, rose in 2007 to 81% for boys and 79% for girls<sup>2</sup>. A universal primary education or, in other words, a schooling rate of 100%, is one of the major challenges of the Millennium Development Goal (MDG) for 2015.

### **Household labour endowment**

The household labour capacity is calculated as the number of economically active household members, using a scale varying according to the age<sup>3</sup>. Household labour varies greatly from one household to another. It ranges from 2 to 19 economically active members, with a mean of 7.5 (table 2.1). The ratio of the household's economically active members over household size gives the complement of an economic dependency ratio of 0.69. This means that 69% of the household's members are economically active, in others words, each household member depends on 0.69 economically active members. Or, inversely, on one economically active member depend 1.44 household members. Moreover, a gender disaggregation of household labour shows that, on

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<sup>1</sup> <http://www.education.gouv.sn/statistiques>

<sup>2</sup> [http://www.unicef.org/infobycountry/senegal\\_statistics](http://www.unicef.org/infobycountry/senegal_statistics)

<sup>3</sup> The number of economically active household members: 7 – 9 years = 0.25; 10-14=0.5; 15-70=1 defined with horticultural households.

average, male labour consists of 4 economically active members and female labour on 3.5 economically active members. This represents respectively 53% and 47% of the overall household labour. The household's labour done by sons and daughters consists of 3.9 economically active members on average; this is 52% of the household labour.

Children constitute an important component of horticultural household labour, due to their great contribution to the different cropping operations. Consequently, child labour by children older than 6 and younger than 15 is estimated. Globally, a household's own child labour plus other child labour gives the total household child labour, which varies from 0 to 4 persons that are economically active, with an average of 0.9. There is no difference between boys and girls.

To the question "Is the family labour sufficient for your horticultural activities?", only 11% of the horticultural households reply "yes". Horticultural cropping is labour-intensive, particularly in developing countries such as Senegal. As a result, most households have insufficient labour to cover the production needs and, subsequently, they employ sharecroppers, hired wage labour and daily hired labour. About 75% of the horticultural households hire labour based on a sharecropping contract. Only 7% of households are using permanent hired wage labour.

Table 2.1: Horticultural households' characteristics over gender

Characteristics	Household		
	Men	Women	Total
<b><i>Household headship</i></b>			
Number	190	13	203
Proportion (%)	93.6	6.4	100
<b><i>Household kinship composition</i></b>			
Head	1		1
Wives		1.8	1.8
Children	3.9	2.6	6.5
Other extended relatives	0.5	1	1.5
Household size (total members)	5.4	5.4	10.8
<b><i>Household education</i></b>			
Household heads' illiteracy rate (%)	87	77	87
Household members' illiteracy rate (%)	66	80	70
Households with no secondary schooled member (%)	80	89	80
Households with no member with a university level (%)	97	99	97
<b><i>Household labour (economically active)</i></b>	4	3.5	7.5
<b><i>Household land ownership (hectare)</i></b>	3.5	0.1	3.6
<b><i>Household livestock (number of heads)</i></b>			
Cattle	2.6	0.9	3.5
Sheep	2.4	1.4	3.8
Goats	2.7	1.9	4.5
Poultry	2	6	8

Source: Own households survey, 2005-2006.

### **Emigration within the household**

The results of the surveys done by the end 2005 show that some horticultural households count some migrants among their members. The migrants can be the head of household, sons or daughters, or other relatives' household members who leave the village to settle in another city or foreign country. Among 203 households surveyed, 82% of the households have no migrant, while the other 17% of the households count 1 to 6 migrants. However, one year later, at the end of 2006, the number of migrants had increased. Clandestine emigration is becoming an increasing and astonishing movement, affecting horticultural households in particular. In fact, the first reason is that the Niayes Zone is located on the Atlantic Ocean and accordingly, is a departure point of boats transporting migrants. The other reason is that horticultural crops are cash crop;

this provides the cash that affords producers the boat ticket, which costs about fcfa 500,000 (769 euro). In the sample studied, about 8 households were affected by this migration. In this way, the number of households with migrants reached 43 (21%) by the end of 2006.

Two types of migratory flow can be identified according to their destination:

- ↳ A domestic flow, generally to Dakar, the capital city, and to other big cities as well as to some major agricultural production and fishing zones (the Senegal River Valley, the coastal zone).
- ↳ An international flow, toward the other African and European countries.

In their region or countries of destination, the migrants are engaging in diverse occupations: they work, for instance, as masons, drivers, traders, students, transporters, fishermen, wage workers, or domestic workers. The majority of them have migrated permanently (82%); only some have migrated seasonally.

## **2.2. Horticultural household resources and assets endowment**

Resources are the base of any production activity. Diversity among rural households is mainly based on differences in resource endowments (Ruben et al., 2004). After having a look at the household human capital that constitutes the labour, we will now examine the other resources, such as land, livestock and other assets.

### **Household land ownership**

Land ownership varies greatly from one household to another. It ranges from 0 to 20 hectares, with a median of 3. About 75% of the households have less than 5 hectares, and 90% has less than 9 hectares. In most households, land is owned exclusively by men. An exception is formed by some households headed by widowed women who became the “supposed” landowners until the male children will become adults and will marry. Also, in some rare cases, powerful women, strongly involved in horticultural production, manage to buy their own land portion. Only in 34 out of 201 households (17%), women own land, the area ranging from 0 to 10 hectares, with a mean of 0.1 hectare. Only 10% of the female landowners have more than 0.5 hectare.

Because of customary norms rather than religious norms, women usually do not inherit land from their parents, as they are supposed to be away, living with a husband who can provide them with land, of which the woman becomes a tenant rather than an owner. When religious norms and particularly Islamic norms are applied, daughters should inherit half of the sons' share for any asset. However, land is usually sold to the sons, while the daughters get their inheritance share in value rather than in nature or land. Often, the head of household shares out land to his sons when they get married, so there is even no land left for inheritance. In some cases where a woman's husband lives in her parents' village, she can generally inherit a small portion of land from her father, if her father has enough land to cover her brothers' needs. That means that, in all cases, men have priority in terms of access to land as the head of the household and as food provider.

Household total land cropped in horticulture ranges from 0.02 to 10 hectares, with a mean of 1.4. About 10% of the horticultural households produce less than 0.25 hectare in horticulture and about 90% of the households less than 3 hectares. In addition to horticultural crops, some households have other crops, like cereals and peanut during the rainy season, in an area of 0.5 hectare on average. About 50% of the households produce only horticultural crops. Not all the land available is cropped. The land use rate, which is the ratio of land cropped over the total land owned gives an average of 46% for horticultural crops and 59% including other crops. This means that on average households are cropping about 59% of their available land per season, showing some possibilities to scale up the cropped area. While some households are just able to exploit a small part of their land, due to limited means or due to too much land owned, some others own just a very small piece of land that they crop completely, even borrowing or renting additional land. Only 9% of the households are borrowing land and 19% are renting land. The land rent costs, on average, fcafa 200,000 per hectare and season. About 90% of the households are cropping less than 100% of their land in any season. Consequently, in general, land availability does not appear as a major problem.

A gender disaggregation shows that in 60% of the households, women are managing their own plots with a total of land cropped in horticulture ranging from 0 to 3 hectares, with a mean of 0.1 hectare. Women exploit small plots, usually allocated by their husband. In about 45% of the households, it is the husband who chooses the plot allocated to his wives (or sisters, mothers ...). Only in about 15% of the households, women themselves choose their plots in their husband's

field. In 40% of the households, women did not manage their own separate horticultural plots; instead, they just participate on men's plots or engage in other off-farm work, mainly small-scale trading, or deal with domestic work, which is enough of a burden in itself (cooking, cleaning house, washing, fetching water and wood ...).

### **Household livestock**

Horticultural households are also cattle breeders. The livestock includes cattle, sheep, goats, horses, donkeys and poultry. The household livestock size varies greatly from one household to another. Some households do not own any livestock or have just a limited number, while others have a livestock well stocked, both in terms of species and the number of heads. On average, the household livestock counts 3 to 4 of each of these species. A gender analysis shows that men as well as women are owners of cattle, sheep and goats. However, there is a gender difference regarding livestock ownership within the household. As can be seen from table 2.1, men own more livestock than women, particularly for cattle. Unlike the other animals, poultry is mainly for women. On average, a household has 8 chickens or ducks, of which 2 belong to men and 6 to women.

In general, livestock plays an important role in the household economy because of its value of reserve and saving. It helps households to overcome hard periods marked by a cash flow deficit. In such periods, households sell some cattle. After harvesting, part of the revenue realized is used to buy cattle. Moreover, for horticultural households, cattle constitute a great source of manure, useful to restore and maintain soil fertility. For women, big cattle as well as poultry is very important to meet emergency needs and to be able to welcome guests warmly with a nice meal.

### **Other wealth of the household**

#### ***Housing***

Only 6% of the households do not have their own house and generally live in their parents' house. Very few households (6%) live in a straw house. The majority of the households (86%) have their stone wall house with a zinc or slate roof. Some households (8%) have a house with a cemented flat roof (terrace). So, contrary to most Senegal rural areas, the horticultural area knows

a great divergence in terms of housing, with well-built houses showing their relatively great wealth or standing compared to others. Obviously, houses belong to men. Only in a few households, the houses belong to women, who then mainly are heads of household (table 2.2).

### ***Transport means***

Carts play an important role in the transportation of inputs and outputs. Unfortunately, the majority of the households have no cart (table 2.2). In all households, men are the cart owners, except in three households headed by women. As is quite unusual for rural households, some horticultural households (5%) own a car. All cars belong to men. The car owners are typically men with off-farm work like trade, transport and house building, or men with a pension, or men receiving a remittance from a migrant.

### ***Other appliances***

Only 5% of the households do not have a radio while 58% do not have a television. In most of these households, the television belongs to the male heads of household and rarely to female heads or a simple household member (table 2.2). The majority of the villages are not yet electrified and solar panels are used for the television and other household appliance. Freezers and air conditioners are still a luxury for horticultural households, essentially due to the lack of an electric connection. Only 33% of the households do not have a mobile phone. The majority of the households have 1 to 5 mobile phones. Particularly for market price information, the mobile phone is most helpful for horticultural households. A gender disaggregation shows that women are lagging behind. Contrary to mobile phones, landline phones are rare (table 2.2).

Table 2.2: Other wealth of the household

Other wealth of the household	Household		
	Total	Men	Women
<b><i>Housing</i></b>			
Household with a straw house (%)	6	6	0
Household with a stone wall house (%)	94	88	6
<b><i>Household with transport means (%)</i></b>			
Cart	43	41	2
Car	5	5	0
<b><i>Household with other appliances (%)</i></b>			
Radio	95	89	37
Television	42	36	6
Mobile phone	67	66	15
Freezer	10	5	5
Air conditioner	17	15	9

Source: Own households survey, 2005-2006.

### ***Bank account***

The analysis of access to financial institutions shows that 40% of the households do not have an account either in a bank or in a micro-financial institution (MFI), while about 60% of households do have one. In 54% of the households, only men have a bank or MFI account, whereas in 6% of the households women have one. However, in some households, the husband borrows money from his bank or MFI and shares a part of his loan with his wives as credit to be reimbursed later. In this way, some women have an indirect access to credit through their husband.

### **2.3. Gender and bargaining within the household**

In some areas of the Niayes Zone, particularly in the north and centre, women manage their own horticultural plots next to men. In other areas, particularly in the south zone and in a part of the centre zone of Niayes, women work on men's plots and do not have their own separate plots. It is interesting to look at the contribution of men on women's plots, as well as to that of women on the plots of their husband. Moreover, the control of inputs used and the decision-making process within the household must be acknowledged, as well as the control of income earned.

### **The division of labour on men's plots versus women's plots**

On men's plots, women rarely participate in nursery work, land preparation and plant treatment. Inversely, transplanting and harvesting are considered as two of women's specialities. Similarly, in most households (71%), women participate in watering. Women's participation on men's plots in cropping operations, such as weeding, fertilizing, and the application of organic fertilizers in particular, is not general. In a few households (7%), women help men to transport the production, basically in cases in which the household does not have a cart. In about 30% of the households, women participate in the selling of specific crops produced on men's plots.

Evidently, on women's plots, men participate a lot in cropping operations such as the nursery, land preparation and plant treatment, which are considered more or less to be men's speciality. In more than half of the households, the participation of men is recorded in the transplanting, harvesting and selling of products of women's plots. Male participation in the weeding, fertilizing and transport of production on women's plots is noticed as well. Inversely, in the majority of the households (83%), men do not help women to irrigate their plot.

To sum up, as can be seen from table 2.3, a reciprocal participation of men and women is not always generalized in all households for all cropping activities. Some gender specialisation comes up, depending on the type of cropping activity. However, although men and women, or more precisely husband and wives, manage their own plots, they provide each other with a reciprocal labour contribution.

Table 2.3: The participation of women on men's plots and vice versa

Cropping activities	On men's plots, do women participate in this cropping activity? (% of households)		On women's plots, do men participate in this cropping activity? (% of households)	
	Yes	No	Yes	No
Nursery	10	90	69	31
Land preparation	1	99	70	30
Transplanting	75	25	56	44
Weeding	9	91	35	65
Watering	71	29	17	83
Fertilizing	17	83	48	52
Plant treatment	0	100	84	16
Harvesting	89	11	58	42
Transport of production	7	93	47	53
Selling of production	30	70	53	47

Source: Own households survey, 2005-2006.

### **The control of inputs and the decision-making process within the household**

To the question “Who decide which horticultural crops to produce in male plots?” about 91% of the households reply “men themselves” and 9% of the households answer “men with the advice of women”. Thus, in the vast majority of the households, men themselves decide on the horticultural crops they grow. Meanwhile, the decision maker of crops to grow on women's plots are the women themselves in 37% of the households, women with the advice of men in 47% of the households, and men in 16% of the households.

Men decided on and paid for all the inputs used in their own plots themselves. This is not always the case on women's plots. About which seed varieties to use, in 35% of the women's plots, men are the decision makers. In 21% of the women's plots, men paid the seed used. With regard to organic and mineral fertilizers, respectively in 13% and 19% of women's plots, men decided on the quantity to be used. In 11% of the women's plots, men paid for the mineral fertilizers and in 4%, for the organic fertilizer, too. In 28% of the women's plots, men decided on the pesticide to be used and paid for it in 12% of the women's plots.

In about 44% of the households, women reimburse to their husband the cost of the input provided. As input providers, men are somewhere decision makers of input choice and the timing of application on women's plots. This creates a kind of dependency of women vis-à-vis men because of (i) a lack of financial means to buy their own input themselves, (ii) or a relative lack of experience compared to men's with regard to input choice and the timing of application, as women are not used to do it, (iii) or men's altruism. This limits the bargaining power of women.

### **The control of income and the decision-making process within the household**

The large majority of the households leave the decision on how to spend a woman's income to herself. In 21% of the households, women decide but with men's advice, while in 3% of the households, it is the men. In 68% of the households, women use their horticultural revenue to satisfy both their own needs and family needs; in 26% of the households, only their own needs; in 4% of the households, only family needs; and in 2% of the households, their husband's needs. To recap, in the large majority of the households, women use their horticultural revenue for their own needs and/or family needs. Women do not co-decide on how men's revenues are spent. This, however, is often spent on family needs, as feeding the family is men's responsibility.

## **2.4. The horticultural household livelihood or income gender-disaggregated**

### **The household total net income**

The sum of the horticultural income, other agricultural income, the off-farm income and remittances gives the total annual income (table 2.4). It varies greatly for men, women and the household itself. Men's total annual income ranges from fcfa 0 to 11,020,000, while that of women varies from fcfa 0 to 4,720,000. The household total annual minimum income is equal to fcfa 103,000 and the maximum is fcfa 11,020,000. This means that while some households earn a very low annual income, equivalent to 157 euro, others earn much more, about 16,824 euro. On average, men's annual income is about fcfa 1,800,000 (2,748 euro) while women's income is about fcfa 298,000 (455 euro). Consequently, the household annual income is on average about fcfa 2,100,000, equivalent to 3,206 euro. Thus, per day, the horticultural household income amount to about fcfa 5,753, equivalent to 8.7 euro and 13 US dollars. Divided by the household size, which is about 10 members, the daily income per member is about fcfa 575, or 0.8 euro or

1.3 US dollars. This means that each household member earns less than 2 US dollars a day, which is the poverty threshold. It is, however slightly, more than 1.25 US dollars, which is the new extreme poverty line in developing economies (World Bank, 2009)<sup>4</sup>. Compared to the national poverty line estimated at fcfa 497 in rural areas, based on the national household survey in 2001/02 (Direction de la Prévision et de la Statistique et Banque Mondiale, 2002), horticultural households are living slightly above the poverty threshold. Nonetheless, compared to the majority of the other rural households growing non-horticultural crops and living with less than 1.25 US dollar a day, horticultural households can be considered as the wealthier group. Obviously, horticulture can be considered as an activity which can help to alleviate poverty. “Experience shows that horticulture can offer good opportunities for poverty reduction because it increases income and generates employment.” (Weinberger and Lumpkin, 2007).

Table 2.4: The household annual income and its composition over gender and season

Variable		Household annual income (fcfa)	Share over gender (%)		Share over seasons (%)		
			Men	Women	First season	Second season	Third season
Horticultural annual income	Mean	1,600,000	84.80	15.20	61.06	29.96	8.97
	Std. dev.	1,700,000	26.00	26.00	24.19	21.32	14.39
Total annual income	Mean	2,100,000	81.76	18.23			
	Std. dev.	1,900,000	24.44	24.44			

Source: Own households survey, 2005-2006.

Horticulture is the foremost source of income, both for men and women. The second source of income is off-farm work. The share of off-farm income is more consistent in women’s income than in that of men. Income generated by the other non-horticultural crops and remittances represents a tiny part of both men’s and women’s annual income, as can be seen from figure 2.1.

<sup>4</sup> <http://go.worldbank.org/CUQLLRX1Q0>

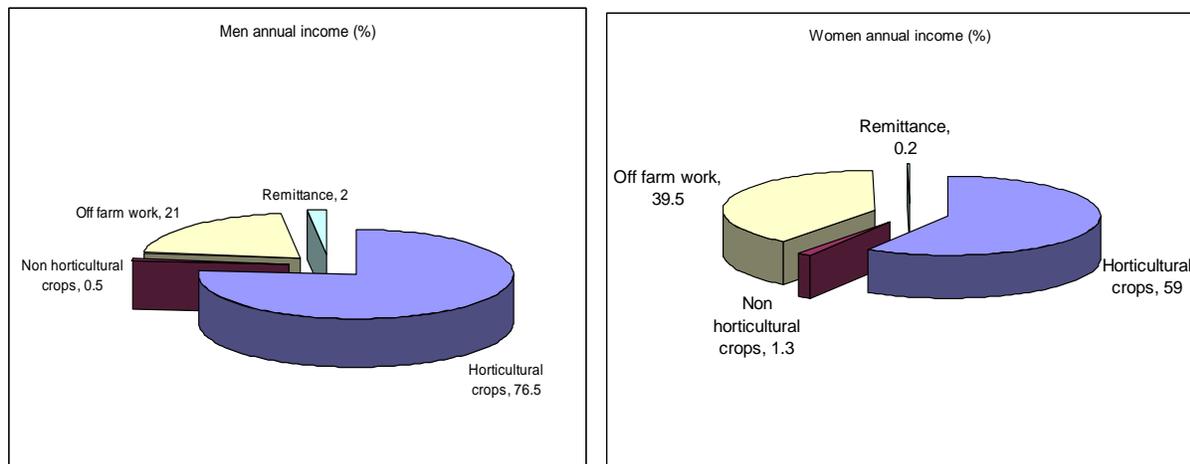


Figure 2.1: Composition of men's and women's total annual income.

### 3. Details on horticultural plots

#### 3.1. Plots and managers

The data are considered as cross-sectional data, with the identifier variable household. In total, 422 horticultural plots were surveyed in the Niayes Zone, managed by 279 producers, of which 190 are men and 89 are women, distributed within 203 households. The number of plots range from 1 to 9 per household, from 1 to 5 per male plot manager and from 1 to 4 per female plot manager. The horticultural plot managers were chosen in such a way that they are dispersed in the northern zone of Niayes as well as in the centre and in the southern part. Within each household, next to men, women are managing their own separate plots, particularly in the northern zone of Niayes. In the centre and to a lesser extent in the south zone of Niayes, there are some women managing their own separate plots, but most of them just participate in men's plots and do other off-farm work. This off-farm work consists mainly of the small-scale trading of horticultural crops they bought from their husband and other, surrounding households.

Among the 422 plots, only 19 belong to households that are female-headed, while all the others belong to households that are male-headed. The female plots are 114 out of 422 plots (27%). Table 2.5 represents the distribution of plots by gender and zone.

The social status of male plot managers is head of household, while female plot managers are mainly wives in a polygamous household, holding the status of first wife, second wife or third wife. Generally, the fourth wives did not live with their husband and the other wives. Only a few

female plot managers are head of household, or sisters, relatives, or mother of the head of household (table 2.5).

Table 2.5: Distribution of plots over gender, zone and social status of the plot manager

Plots over zone and manager's status	Managers			
	Frequency			Percent
	Men	Women	Total	
<b><i>Zone</i></b>				
North	131	74	205	49
Centre	83	10	93	22
South	94	30	124	29
<b><i>Total</i></b>	<b>308</b>	<b>114</b>	<b>422</b>	<b>100</b>
<b><i>Social status</i></b>				
Household head	308	19	327	77.49
First wife		52	52	12.32
Second wife		28	28	6.64
Third wife		8	8	1.90
Sister or female relative		6	6	1.42
Household head's mother		1	1	0.23
<b><i>Total</i></b>	<b>308</b>	<b>114</b>	<b>422</b>	<b>100.00</b>

Source: Own households survey, 2005-2006.

### 3.2. Horticultural crops

Five of the most frequently cultivated crops, such as onion, cabbage, tomato, green bean and potato, were surveyed. All these crops are destined for the national and sub-regional market. Only green bean is exported to European countries, mainly to France. Except potato, all the other crops are produced by both men and women, in the same order of frequency. Table 2.6 gives the overall distribution of the crops across men and women plots in the sample.

Table 2.6: Distribution of crops across men and women plot managers in the sample.

Crops	Plot managers		
	Men	Women	Total
Onion	110 <sup>5</sup>	49	159
	69.18 <sup>6</sup>	30.82	100.00
	38.19 <sup>7</sup>	42.98	39.55
Cabbage	100	46	146
	68.49	31.51	100.00
	34.72	40.35	36.32
Tomato	49	16	65
	75.38	24.62	100.00
	17.01	14.04	16.17
Green bean	16	3	19
	84.21	15.79	100.00
	5.56	2.63	4.73
Potato	13	0	13
	100.00	0.00	100.00
	4.51	0.00	3.21
Total	288	114	402
	71.64	28.36	100.00
	100.00	100.00	100.00

### 3.3. The horticultural plots' physical condition

#### Plot area

The plot area cropped varies greatly between households and within the household. Overall, the plot area ranges from 20 m<sup>2</sup> to 1 hectare, with an average of less than 1/5 hectare. About 46% of the plot managers crop less than 1,000 m<sup>2</sup>, while 5% crops more than 4,000 m<sup>2</sup>. A gender disaggregation shows that, with an average of 460 m<sup>2</sup>, women's plots are 4.7 times smaller than men's plots, with an average of 2,184 m<sup>2</sup>.

<sup>5</sup> Frequency.

<sup>6</sup> Row percentage.

<sup>7</sup> Column percentage.

## **The plots' physical condition**

### ***The plots' soil suitability appreciation***

Overall, most of the plot managers found the quality or suitability of their soil to horticulture to be good (77%). Some others (22%) found it medium and very few found it bad (1%). The gender analysis reveals some difference, with fewer women appreciating their plot soil as good (72%) and more women qualifying it as medium (25%) and bad (3%), compared to the overall and men's appreciation frequencies.

### ***The plots' slope appreciation***

Overall, 84% of the plot managers well appreciate the slope of their plot. A gender disaggregation also shows that 81% of the male plot managers and 90% of the female plot managers found the slope of their plot favourable for cropping. This means that there is no a priori gender discrimination regarding access to good land.

### ***The plots' soil problem***

Overall, almost half of the plot managers affirmed having no soil fertility problem at all on their cropped plots. The others identified as soil fertility problem the scarcity of organic matter (37%), the salinity (7%), a nematode infestation (3%), and the acidity (2%). The number of women plot managers having no soil fertility problem on their plots (45%) is a little bit lower than that of men (50%). For both men and women, the soil problems remained the same in terms of order, but differ a little bit in terms of frequency.

### ***The distance from the house to the plot***

The distance from the plot to the house ranges globally, from 0.01 km to 8 km, with a mean of 1.4 km. It varies greatly from one household to another, and less within the household. Women's plots are nearer to the house, with a distance varying from 0.01 km to 5 km and an average of 1.14 km, compared to men's plots, which are located on average 1.45 km from the house.

In terms of the appreciation of the distance from the house to the field, globally, 33% of the plot managers found it near, for 45% it was acceptable, and for 22% it was far. There is no major gender difference in the appreciation of the distance.

**Conclusion:** To conclude, with respect to plot area and land ownership, a great gender gap occurs. Within the household, most of the female plot managers are not the owner of their land plot; it is mainly their husband's property. In terms of the area, plots cropped by women are much smaller than those of men. However, regarding the physical condition of the plot, no major gender discrimination is noticed. In terms of the plots' soil quality or suitability, the plots' soil fertility problem, the plots' slope as well as the distance from the plot to the house, women in any case are not in an unfavourable situation compared to men.

### **3.4. An evaluation of the plot production cost**

#### **Inputs used on men's and women's plots**

The quantities of inputs such as seed, organic fertilizer, urea, and NPK fertilizer vary greatly from men's to women's plots, between and within households. As can be seen from table 2.7, there is a great difference in the input used. The quantity of inputs and, consequently, the cost per hectare, are higher on women's plots than on men's plots. As a result, women surprisingly used inputs more intensively than men do. The mean difference between men's plots and women's plots in terms of the quantity and cost of the seeds, organic fertilizer, and urea used per hectare is negative and significantly different from zero at the 5% level. However, the difference in NPK fertilizer and pesticide used on men's and women's plots is not significant even at the 10% level (table 2.7).

Table 2.7: Gender comparison of inputs used per hectare on men's and women's plots within households.

Variables input	Input quantity per plot (kg/ha)				Input cost per plot (fcfa/ha)			
	Men's plots		Women's plots		Men's plots		Women's plots	
	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Seeds <sup>8</sup>	2.50	3.19	3.12	4.03**	166,666	197,081	195,000	330,155***
Organic fertilizer	7,500	13,412	13,500	17,736**	110,000	142,118	145,000	177,448**
Urea fertilizer	340	467	500	704.34***	82,725	113,119	110,000	165,472***
NPK fertilizer	310	413	310	450.05	60,000	74,763	66,666	85,728
Pesticides					40,000	70,039	50,000	85,158

\*\*\*, \*\* Gender mean difference significant, respectively, at the 1% and 5% level.

***Conclusion:*** Taking into account the plot area, women use inputs more intensively than men. In terms of decision-making about the use of inputs, some women still remain dependent on their husband. To restore soil fertility and particularly organic matter, and to have a good yield, both male and female horticultural producers use a lot of organic and mineral fertilizers, which casts doubt on the quality or appropriateness of the formula of the mineral fertilizers. Moreover, the excessive doses of mineral fertilizers used contribute to increasing the acidity of both the soil and water table, which is becoming a great environmental and public health problem.

### **Water used on men's and women's plots**

#### ***Water sources used for irrigation***

The sources of water used for irrigation vary, depending on the household's financial capacity and access to information, but also on the zone and the proximity of the water table. Consequently, in the centre zone of Niayes, where the water table is high, households are using traditional non-cemented wells and trench wells. In the north and south zones of Niayes, on the

<sup>8</sup> For seed, only cabbage, tomato, and onion are accounted for. Potato and green bean are not considered because the type of seed is not similar to the previous ones.

other hand, where the water table is very deep (up to 10 metres), households use cemented wells and water from the SDE (the Water Corporation), respectively.

The number of traditional wells per plot ranges from 1 to 7 for men and from 1 to 3 for women. As in most cases the land belongs to men, so do the wells. Among the 35 out of 114 women using traditional wells, only 11 are the owners. The number of wells per hectare is 72 on average.

Hydraulic wells or cemented wells are used mainly in the north zone of Niayes and in part of the south; 65% of the male plot managers used it, with a number varying from 1 to 30 wells per plot and with an average of 60 wells per hectare. Among female plot managers, 76% used from 1 to 6 hydraulic wells per plot, but only 24% of these women own their hydraulic wells.

Micro tube wells or boreholes are used only by three men plot managers. In the south zone of Niayes, water from the SDE Corporation is used by 5% of the plot managers. This involves 21 plot managers, of whom 17 are men and 4 are women.

### ***Irrigation equipment used on the plot***

The sources of water as well as the irrigation equipment used vary greatly, not only from one zone to another, but also between and within households, depending on the gender of the plot manager. For instance, in the centre zone of Niayes, where motorized pumps are used for irrigation, none of the women plot managers has a motorized pump for irrigation, whereas 22.5% of the male plot managers do have one. The women use buckets, ropes and pulleys to fetch water from wells and for irrigation. Twenty percent of the male plot managers used a garden hose as watering material, while none of the women used it. Twelve out of 288 men and 3 out of 113 women plot managers use a sprinkler for watering. Only 6 men and 1 woman use a drip system, covering 1,000 to 5,000 m<sup>2</sup>. A proportion of 9.3% of male plot managers use 1 to 52 basins to water their plot, versus 2.6% of the female plot managers, who use 1 to 3 basins.

### **Conclusion**

The sources of water and the irrigation equipment vary greatly from one zone to another, between and within households. In terms of the appreciation of water availability and water quality by

men and women plot managers, we have found no major difference. However, while some men plot managers used some improved, less time-consuming irrigation equipment, like a motor pump, women are still using buckets, ropes and pulleys for irrigation. Subsequently, there is a gender gap in terms of irrigation equipment used and regarding the ownership of water sources.

### **Labour used on the plot**

On some plots, only household labour is used, while on others, the managers in addition use hired labour as well. Labour is hired under a wage contract or sharecropping contract.

### ***Labour on plots under household labour***

The household members working on the plot consist of the plot manager him- or herself, spouses, sons, daughters, and other parents or relatives (brother, sister, mother, nephew, niece ...). The time spent by these household members varies from men's plots to women's plots within households as well as between households. On average, men plot managers spend 177 hours on their plot, whereas women plot managers spend 265 hours. Despite the fact that women's plots are smaller than those of the men, women spend more time working on it. In addition, women spend 32 hours on their husband's plots, while men spend 8 hours on their wives' plots. This can be explained by the fact that the men are polygamous, which means that they have one to three wives working on their plots. While sons work more on their father's plots than on their mother's plots, daughters work more on their mother's plots than on their father's plots. Other household members spend more time on men's plots than on women's plots. In total, more time is spent by household members on men's plots than on women's plots (table 2.8).

Table 2.8: Time spent per plot and season by household members working on men’s and women’s plots over plots under household labour.

Household members	Men’s plots				Women’s plots				
	Time (hours)		Time share (%)		Time (hours)		Time share (%)		
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Plot manager	177	224	30	34	265	201	59	36	
Spouses	32	128	3	6	8	10	2	2	
Sons	623	1811	49	40	69	208	13	26	
Daughters	49	178	5	15	106	194	19	32	
Other members	162	459	13	26	37	116	7	22	
Total	1048	1425	100		486	298	100		
<i>Observation (plot)</i>					153				96

Regarding the different cropping operations, on men’s plots as well as on women’s plots, watering is the most time-consuming operation. Watering takes 873 hours of household working time on men’s plots and 422 hours on women’s plots. In terms of the share of total working time of household members, watering represents 75% and 85% respectively on men’s plots and women’s plot. This means that watering takes more time on average on women’s plots. This can be explained by the difference in irrigation technology used. In fact, women do not have access to a motorized pump or other more sophisticated irrigation material as do men. On men’s plots, the use of a motor pump reduces the time spent by household labour per cropped area by 39%. Transplanting, weeding, and harvesting come in second in terms of time consumption (table 2.9).

Table 2.9: Time spent per cropping operation by household members working on men's and women's plots under household labour.

Cropping operations	Men's plots				Women's plots			
	Time (hours)		Time share (%)		Time (hours)		Time share (%)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Nursery bed	13	22	2	3	6	5	1	1
Land preparation	28	42	3	3	8	13	2	2
Transplanting	38	40	5	7	20	36	4	6
Watering	873	1806	75	21	422	281	85	8
Weeding	42	57	6	8	11	15	3	3
Fertilizing	9	13	2	7	3	3	1	1
Plant treatment	6	12	1	2	2	1	1	1
Harvesting	39	47	6	8	14	9	3	3
Total	1048	1425	100		486	298	100	

#### ***Labour on plots under a hired wage labour contract***

On 29 out of 422 plots, hired wage labour is used; this is about 7% of the plots. Among the 29 plots, 26 are men's and 3 are women's. The number of workers hired per plot ranges from 1 to 8 on men's plots and from 1 to 2 on women's plots. The hired wage workers are men. The contract duration is 3 months for 86% of the plot managers. For some crops, it can be a shorter (2 months) or a more extended (4 months) period. Plot managers provide hired workers with facilities, such as food provision, housing, health care and others, like a telephone. The most costly facility is food provision, which amounts on average and per season to fcfa 91,788 on men's plots and fcfa 75,000 on women's plots. Housing costs about fcfa 10,000 for both men's and women's plots.

The time spent by wage workers is higher on men's plots than on women's plots. In most of the cases, hired wage labour is paid at the end of the cropping season rather than monthly. The total cost of wage labour per plot, including facilities, is on average fcfa 223,000 on men's plots and fcfa 186,000 on women's plots. The monthly wage per hired worker is on average more or less the same on men's and on women's plots (table 2.10).

### ***Labour on plots under a sharecropping labour contract***

Under a sharecropping contract, the landowner provides all the required inputs and some facilities, such as housing, food and health care to the sharecropper. In return, the sharecroppers provide their labour force and expertise to produce. At the end of the season, the profit of the production is divided equally over the landowner and the sharecropper.

About 31% of the plot managers use labour based on a sharecropping contract. A total of 110 out of 288 men's plots (38%) and 14 out of 113 women's plots (12%) are under sharecropping labour. The number of sharecroppers used ranges from 1 to 10 on men's plots and 1 to 3 on women's plots. The sharecroppers came from the other regions of Senegal (80.5%), from neighbouring countries such as Mali, Guinea Conakry, Bissau Guinea, Burkina Faso (8.5%), or both from inside and outside of Senegal for the same plot manager (11%). The average age of sharecroppers ranges from 22 to 30 years, with a minimum age of 12 and a maximum age of 49.

The sharecroppers' total working time per cropping season is on average 1,325 hours for an average of 2 sharecroppers on men's plots, against 589 hours for an average of 1.1 sharecroppers on women's plots. The average payment per sharecropper is greater on men's plots than on women's plots; this difference is significant at the 10% level. Sharecroppers earn more on men's plots than on women's plots. Per hour, a sharecropper earns on average fcfa 262 on men's plots and fcfa 194 on women's plots. Including the cost of all facilities provided or in-kind payments (food, housing ...), the average wage rate per hour and per sharecropper amounts to fcfa 584 on men's plots and fcfa 466 on women's plots.

A worker hired under a sharecropping contract earns more per season than a worker hired under a wage contract, both on men's and women's plots. However, as sharecroppers work more than wage workers in terms of time, their average wage rates per hour are comparable (table 2.10).

Even on plots under a sharecropping or wage labour contract, household labour contributes to time-consuming cropping operations such as transplanting, weeding, and harvesting. The time spent by household labour on plots based on wage labour is greater than that on plots based on sharecropping labour for both men's and women's plots. On plots under a wage labour contract, not only household labour contributes more to the work, but in addition, the plot manager also

spends time supervising the hired workers. Table 2.10 recapitulates the time spent by labour and the wage paid by a household to labour over gender and labour contract.

Table 2.10: Labour time and wage over plots under household labour, a wage labour contract and a sharecropping labour contract.

Labour time and wage	Men's plots		Women's plots	
	Mean	Std. Dev.	Mean	Std. Dev.
<b>Labour time</b>				
<i><b>Plots under household labour</b></i>				
Total labour time per plot and season (hr)	1048	1425	486	298
Observations (plots)	153		96	
<i><b>Plots under a wage labour contract</b></i>				
Hired wage workers' time per plot and season (hr)	536	589	353	295
Household labour time per plot and season (hr)	666	551	533	558
Total labour time per plot and season (hr)	1028	708	822	495
Observations (plots)	26		3	
<i><b>Plots under a sharecropping contract</b></i>				
Sharecroppers' time per plot and season (hr)	1325	1492	589	157
Household labour time per plot and season (hr)	246	402	84	64
Total labour time per plot and season (hr)	1552	1553	650	267
Observations (plots)	110		14	
<b>Wage or payment</b>				
<i><b>Wage labour</b></i>				
Monthly wage per worker (fcfa/month)	23,425	12,202	20,000	0
Seasonal wage per worker (fcfa/season)	68,545	37,643	60,000	0
Total wage paid per plot (fcfa)	117,980	79,595	100,000	34,641
Wage paid per hour and worker (fcfa)	283		211	
Working time per hectare (hours/ha)	1,697	1,725	425	193
Total wage paid per hectare (fcfa/ha)	315,865	172,399	200,000	69,282
<i><b>Sharecropping labour</b></i>				
Seasonal payment per sharecropper (fcfa)	140,008	67,825	107,057	68,469
Total payment of sharecroppers (fcfa/plot)	347,763	462,871	114,200	67,264
Wage per hour and per sharecropper (fcfa)	262		194	
Working time per hectare (hour/ha)	2,481	4,505	1,240	5,414
Total payment per hectare (fcfa)	1,514,172	972,153	1,533,564	563,223

### 3.5. Evaluating the output of the plot

#### The production and yield per plot

The ratio production and plot area gives the yield, which permits us to make an appropriate comparison between men and women plot managers. Since the crops (onion, cabbage, tomato, green bean, and potato) are all vegetables and have a similar average yield per hectare, it is possible to compare their yield together. For all crops, women's plots yield on average 2.8 kg/m<sup>2</sup>, while men's plots yield 2.3 kg/m<sup>2</sup>; per hectare, this is 28,979 kg and 23,277 kg, respectively. This difference is significant at the 1% level. Women's plots are smaller than men's plots but yield more per hectare, as can be seen from the box plot graph (figure 2.2).

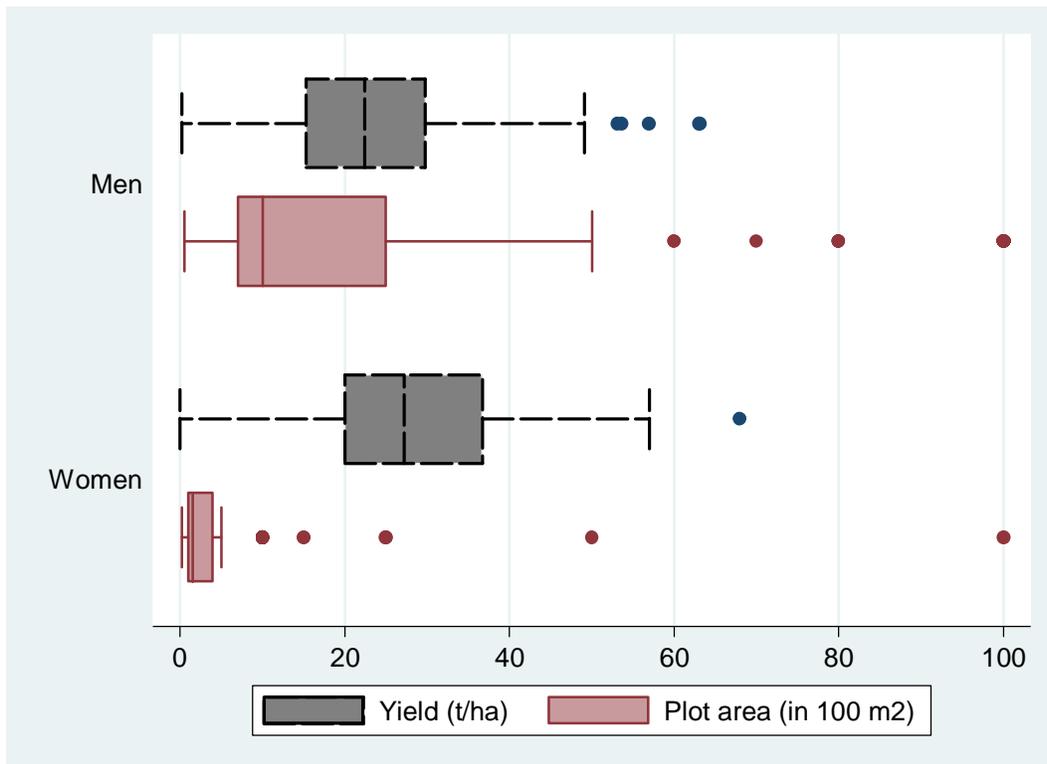


Figure 2.2: Box plots of yield and plot size over the gender of the plot manager.

The analysis of the yield evolution between 2004 and 2006 shows that women's plots yield more than men's plots. The yield varies over the years, but the same tendency is observed for both men and women for all crops and for onion (figure 2.3).



Figure 2.3: Gender comparison of the yield evolution over years.

### The output price

For most horticultural crops, the harvest does not take place in one go, but is spread over time. The same goes for the selling. Globally, the number of sales corresponding to the number of (partial) harvests ranges from 1 to 10 per crop and plot. Because of a lack of storage and conservation means, the horticultural production harvested is usually sold automatically at the field gate or at the markets. The selling price varies greatly (fcfa/kg 134 to 340) between households as well as within households and from men to women (figure 2.4). The selling price also changes greatly from one harvesting to the next one (fcfa/kg 213 to 268), which usually takes three days to one week and two weeks for the last harvesting. This high price volatility is one of the major risks men and women producers face. Surprisingly, for overall crops, the women's selling prices are almost always higher than those of the men. While for some crops, like onion, the husband usually does the selling, for others, such as tomato and cabbage, the women mostly do the selling. The latter do their selling generally in retail, which allows them to have a better price compared to the men, who sell the production in wholesale. While the women's crops' selling prices increase over time, or from the first to the last harvest, the men's crops' selling

prices decrease. This can be seen from graph 2.4 for all crops (onion, cabbage, tomato, green bean and potato) on 402 plots and for tomato on 65 plots.

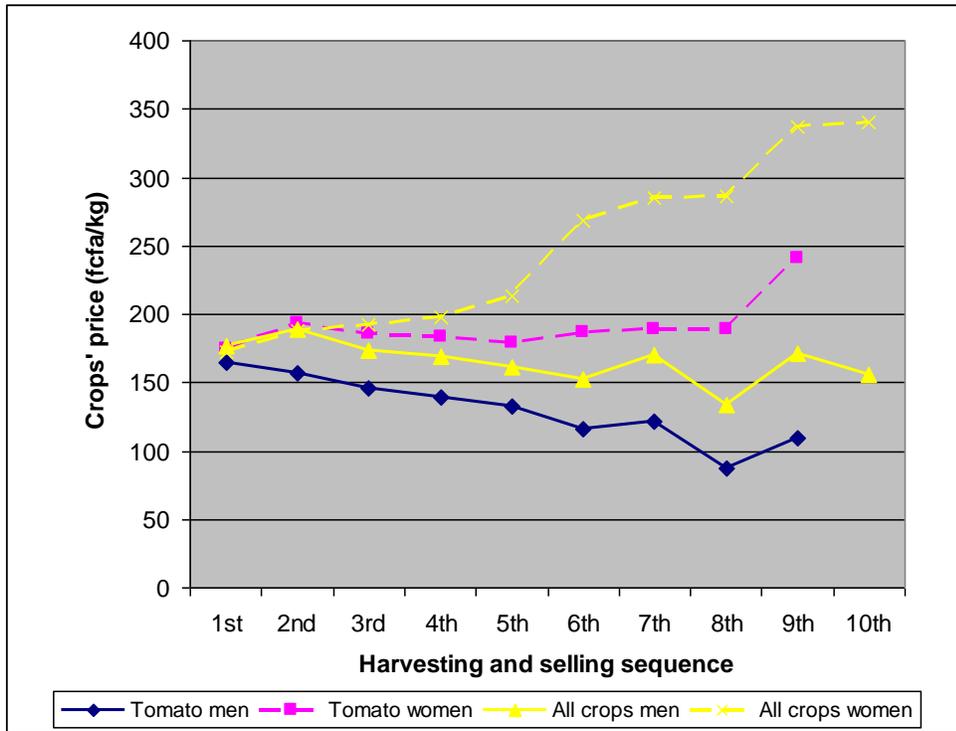


Figure 2.4: Gender comparison of horticultural crops' selling price over harvesting sequence per plot.

### The output in value or revenue

Women earn from their plot fcfa 465 per m<sup>2</sup>, while men earn fcfa 396 per m<sup>2</sup> on average for all crops. In percent, women's plots bring 17% more output in value per hectare than men's plots do. The difference is significant at the 5% level (table 2.11). Moreover, the output in value or revenue varies greatly for each of the crops from one plot manager to another, for both men and women. In percent, the difference of output in value per hectare between women's and men's plots is 15% for onion, 13% for cabbage, 22% for tomato, and 0% for green bean. Nevertheless, the difference remains not significantly different from zero even at the 10% level for each of the crops (table 2.11).

Table 2.11: Output in value per plot, per hectare, and per crop on men's and women's plots.

Crops	Output in value per hectare (in 1000 fcfa/ha)			
	Men's plots		Women's plots	
	Mean	Std. Dev.	Mean	Std. Dev.
All crops	3,964	3,005	4,656	2,520
Onion	4,380	2,952	5,057	2,785
Cabbage	3,847	3,004	4,361	2,129
Tomato	3,762	2,718	4,615	2,743
Potato	2,508	1,424		
Green bean	2,640	1,641	2,648	808

**Conclusion:** The horticultural market is characterized by a high variability of the price over time. Taking into account the area, the revenue per hectare is 17% higher on women's plots than on men's plots.

### 3.6. The profitability of crops across gender

The revenue per hectare minus the total costs per hectare of inputs, including seeds, mineral and organic fertilizers, pesticides, water (the connection to the water corporation), fuel (for the motor pump), hired wage labour and sharecropping labour, gives the profit per hectare. The costs of the depreciation of the equipment and household labour are not accounted for. On average, for all crops (onion, cabbage, tomato, green bean, and potato), the profit per hectare is fcfa 2.6 million on men's plots and fcfa 3.7 million on women's plots. Consequently, the profit is 40% higher on women's plots than on men's plots; this gender difference is significant at the 1% level. Controlling for crop, a similar significant gender difference in profit is observed for onion and cabbage (table 2.12). For both men and women, the highest profit is realized with onion, but the difference is only significant with green bean and potato.

Table 2.12: Comparison of profit per hectare across crops, gender, and labour.

Variables	Men's plots (in 1000 fcfa/ha)		Women's plots (in 1000 fcfa/ha)	
	Mean	Std. Dev.	Mean	Std. Dev.
All crops	2,638	2,696	3,699	2,543***
Onion	2,871	2,327	4,162	2,823***
Cabbage	2,659	2,942	3,381	2,100*
Tomato	2,504	2,587	3,554	2,749
Potato	1,214	1,482		
Green bean	1,572	1,255	1,571	1,344

\*\*\*, \*\*, \* gender difference significant at the 1%, 5%, and 10% level, respectively.

#### 4. Conclusion

Altogether, this descriptive paper, part of a thesis, brings to the fore three issues:

- 1) A great gender gap occurs in the resource and assets allocation, particularly with regard to access to land and irrigation equipment. Mainly the men are the owners of land within the household. In 60% of the households, women are really involved in horticulture, managing their own piece of land, which is usually allocated to them by their husband. Women's plots are 4.7 times smaller than men's plots are. With this small plot size, the intensity of inputs used is higher on women's plots than on men's plots. As a result, women's plots yield 17% more in terms of the output in value per hectare and 40% more in terms of the profit per hectare than men's plots do. Does this imply that women are more efficient than men? This raises the problem of the optimality of the allocation of household resource between men and women.
- 2) The horticultural production is so labour-intensive that household labour is not always sufficient. In addition to household labour, some households have recourse to hired labour. However, while some households hire labour based on a sharecropping contract, others hire labour based on a wage contract. The returns to a sharecropper from sharecropping per season are on average higher than the seasonal wage paid by the household to a wage worker. Moreover, the most time-consuming cropping operation is irrigation, which takes 75% and 85% of the total working time of household members on men's plots and women's plots,

respectively. Thus, the time-share of irrigation is on average higher on women's plots than on men's plots, because women do not have access to improved irrigation equipment, like a motor pump. A comparison of men's plots irrigated and non-irrigated with a motor pump shows a decrease by 39% of the working time spent by household members per cropped area when a motor pump is used. Such a context calls for an investigation of the reasons behind the choice of a labour contract, based either on a sharecropping contract or a wage contract and allowing for the use of labour-saving irrigation equipment like a motor pump. With regard to a household's profit optimization, what is the efficient labour choice, especially in view of the use of a motor pump?

- 3) The horticultural marketing context is characterized by a high variability of the output price, which is a major risk that men and women plot managers within a household have to tackle when producing. For the same plot and crop, the selling price of the production varies greatly from one harvesting sequence to the next one, which takes no more than a few days. Such a risky marketing context raises some questions: how do men and women or husband and wives behave when confronting this output market price risk? To what extent are men's and women's risk preferences related to their individual and household characteristics? How does their risk behaviour regarding output market price impact upon their economic performance and particularly on their efficiency in their use of inputs and choice of labour contract?

To find out the answers to all these research questions, raised by this descriptive paper, is the objective of the next analytical chapters developed in the thesis (Ndoye Niane, 2010).

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