

**DIAGNOSIS OF SEEDS SUPPLY OF LEAFY VEGETABLES
IN YAOUNDÉ, CAMEROON****Pousseu L^{1*}, Pegalepo E⁴, Kouamé C², Bell JM³ and RT Kamga¹****Adelphe Lyliane Pousseu**

*Corresponding author's email : padelyl@yahoo.fr / lyliane.pousseu@worldveg.org

¹AVRDC- The World Vegetable Center, Liaison office Cameroon. P.O. Box 2008 Messa, Yaoundé, Cameroon

²ICRAF Côte d'Ivoire Country Programme. 08 BP 2823 Abidjan 08

³ Faculty of Sciences, University of Yaoundé I, P.O. Box 812 Yaoundé, Cameroon

⁴AfricaRice-Centre du riz pour l'Afrique 01 BP 2031 Cotonou-Bénin.

ABSTRACT

The traditional leafy vegetables play a major role in the Cameroonian diet. In the metropolitan zone of Yaoundé, these vegetables are produced year round in family and commercial exploitations. The quality of the seeds, their mode of production and their system of distribution are little known. With the aim to better understand the seed system of traditional vegetables, a study on the supply, the production and the quality of these seeds was carried out. The data were collected using questionnaires on a sample of 133 traditional leafy vegetable producers of the urban and peri-urban zone of Yaoundé. The data were analyzed using SNAP 9 software. The study showed that the most produced species are amaranth (*Amaranthus cruentus*), nightshade (*Solanum scabrum*) and jute mallow (*Corchorus olitorius*). The market-gardeners are influenced in their choice of vegetable to cultivate by the preference of the customers (85.7% of the respondents) and the productivity of the cultivars (66.2% of the respondents). More than 40% of the respondents buy seeds in the markets while 7.5% buy seed from other producers and 10.5% in the agricultural inputs stores. About half (47.4%) of the respondents produce seeds by leaving plants in the field after the first or the second harvest while 36.8% of the market-gardeners select the most vigorous plants for seed production. On average, 58.7% of respondents preserve the seeds in hermetically closed bottles and plastic bag. Storage on field is practiced by a significant part of market-gardeners (41.4%). A total of 79.7% of the producers reported constraints with the produced seeds. Poor seed germination (81.1% of respondents) and the non uniformity of the seed (48.1% of the producers) were reported as the major constraints. The principal source of seed supply in the metropolitan zone of Yaoundé is the self production with rudimentary production and storage techniques subject to many qualitative constraints.

Key words: leafy, vegetables, seeds, supply, quality

INTRODUCTION

Cameroon is an agricultural country. Agriculture is practiced by 70% of the working population and contributes 30% to GDP. However, it remains the main economic activity on which people rely [1]. Yaoundé, Cameroon city, illustrated with a growth rate estimated at 6% per year and its population may exceed four million by 2020. This growth, due (among other reasons) to migratory flow of young people from villages to urban centers, results in lack of employment creating unemployment and declining agricultural production in rural areas supposed to supply the cities with food [2, 3]. In Yaoundé, due to unemployment estimated at 30%, many urban residents are engaged in agriculture around their house in the suburbs where the density of buildings is still low. An urban and peri-urban agriculture area contributes to the creation of employment, income diversification and strengthening of food self-sufficiency. It is mainly characterized by vegetable crops and more than 2000 such producers live in Yaoundé [3].

Vegetable crops in the area are characterized by the culture of traditional leafy vegetables that are practiced mainly in the inland valleys where water access is easy. The development of this type of agriculture is often limited by access to inputs [4]. The seeds of traditional leafy vegetables are still sold in the informal sector. Production techniques of these seeds are still very poorly controlled and produced seeds are subject to numerous problems [3-5].

To help improve the seed system of traditional leafy vegetables, this study was conducted. The objectives were to characterize the production systems of leafy vegetables, identify the species of traditional leafy vegetables grown in the inland valleys of Yaoundé, identify sources of supply and quality of seed produced, and analyze the constraints on production and the distribution of quality seeds in this sector.

METHODOLOGY

Study area

This study was conducted in the urban and peri-urban area of Yaoundé. Yaoundé is located between 3°50' north latitude and 11°31' east longitude at an altitude of 760 m covering an estimated surface area of 256 km². The climate is Equatorial Guinea characterized by four seasons: a long dry season from December to February, a short rainy season from March to June, a short dry season from June to August and a long rainy season from September to November. The annual rainfall of Yaoundé is 1600mm with average temperatures varying between 17°C and 30°C. Soils are lateritic, characterized by high clay content. The population of Yaoundé is approximately 1.5 million.

Data collection and sampling procedure

Data for the study were collected using semi-structured questionnaires administered to 133 producers of leafy vegetables in the inland valleys of the peri-urban area of

Yaoundé. Field visits were also conducted to observe farmers' fields. The survey was conducted in seven (7) inland valleys of the city. Farmers were selected according to criteria described by Temple-Boyer [6] where the cultivated land area of the inland valley and the intensity of gardening are used to determine the sample sizes. Thus, in areas with high gardening activity, the number of producers surveyed was higher than in areas of low activity (Table 1).

Data collected included socioeconomic characteristics of farmers, the seed supply system, factors influencing the decision of choice of varieties produced, methods of seed production and the quality of seeds produced.

Statistical Analysis

Collected data were codified and analyzed using SNAP 9 software (Survey Network Adjustment Package). A simple frequency analysis in Microsoft Office Excel was used for the description of the sample and especially to determine the different types of vegetables grown for each site.

RESULTS

Socioeconomics profile of the producers

The results show that the production of leafy vegetables is practiced by both men and women in the inland valleys of Yaoundé. The majority of producers are women (64.7%). The ages of producers are in the range of 17 to 65 years. Most of the producers are young, in the age range of 20-40 years old. Leafy vegetable producers are generally married individuals (63.9%) who manage their own farms. Only 25.6% of the producers are single and very few are either widows or divorced (Table 2).

Traditional leafy vegetables grown

Nightshade (*Solanum scabrum*), amaranth (*Amaranthus cruentus*) and Jute mallow (*Corchorus olitorius*) are the three most grown vegetables in the peri-urban area of Yaoundé. These leafy vegetables are produced respectively by 98.5%, 97.7% and 84.2% of the respondents. Bitter-leaf (*Vernonia amygdalina*), okra (*Abelmoschus esculentus*) and leafy eggplant (*Solanum macrocarpum*) were produced respectively by 60.2%, 36.1% and 31.6% of growers surveyed (Table 3).

Factors influencing the choice of vegetables to grow

In this study, the reasons for growing leafy vegetables were identified (Fig. 1). Producers are directed by consumers' preference (85.7% of respondents) and yield (66.2% of respondents). Seed availability appears to be a factor not as much of importance for these producers as only 3% of respondents found seed as an important production factor.

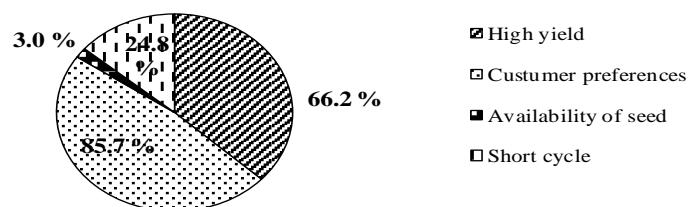


Figure 1. Factors influencing the choice of vegetables cultivated.

Sources of seed supply

The sources of seed supply are indicated in Figure 2. The vast majority of respondents (76.7%) produce their own seeds. Markets and agricultural input stores are other sources of seed supply. Thus, 40.6% of producers buy their seeds from the market and 10.5% from agricultural inputs stores. Only 7.5% of producers obtain their seeds from other producers. It was also observed that producers used several sources of seed supply as a mean to diversify their seed stock and also as a measure of security for seed availability.

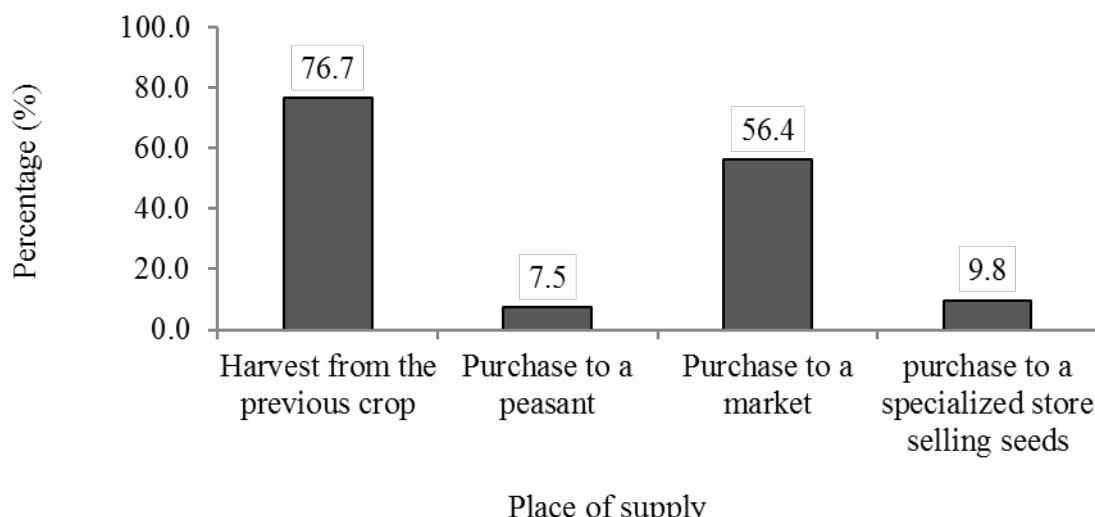


Fig. 2. Sources of seeds supply

Production systems and seed conservation

Two seed production techniques are practiced by vegetable producers in Yaoundé. The first method, practiced by 47.4% of respondents, consists of leaving some plants in the field after the first or second harvest for seed production. The second technique

is practiced by 36.8% of respondents, where the most vigorous plants are selected to produce seed (Fig. 3a). The leaves of those selected plants are not harvested, but left in the field and only harvested for planting during the next growing season. The majority (70.7%) of the vegetable producers interviewed produce their own seeds each growing season (Fig. 3b). Thus, the seeds produced are stored for the next planting cycle.

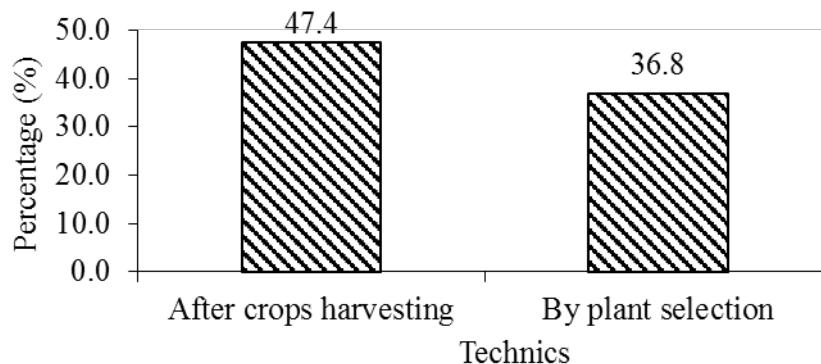


Fig. 3 a. Seed production techniques

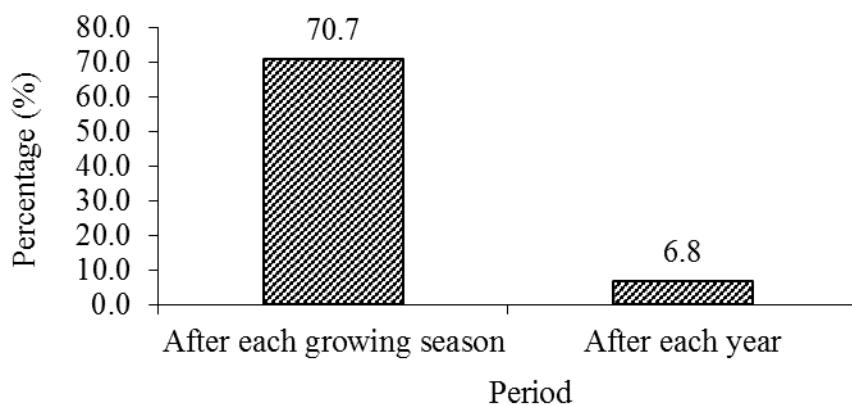


Fig. 3b. Period of seed production

Seed storage is still rudimentary. Seeds are stored in several types of containers generally without the addition of chemicals to control pests. The results show that 58.7% of respondents keep their seeds in bottles and plastic bags sealed hermetically. A relatively large part of respondents (41.4%) store their seeds by leaving the entire plant on the farm. This mode of conservation is especially used for amaranth seeds. The preserved seed is used immediately in the next season.

Quality of seed produced

The survey revealed that the quality of seed produced is a major concern for most (79.7%) of the producers. The majority of respondent (81.1%) indicated that poor germination of seeds is the major setback of the seed production by farmers. Non-uniformity of the seed (size, mixture) and diseases such damping off and seed rotting are two other factors that depreciate seed quality. The study shows that seed

availability and conservation are not limiting factors in the production systems of leafy vegetables in Yaoundé. Of the major vegetable species produced in the inland valleys, the seeds of nightshade and Jute mallow are affected the most by the problems of low germination and non-uniformity (Fig. 4).

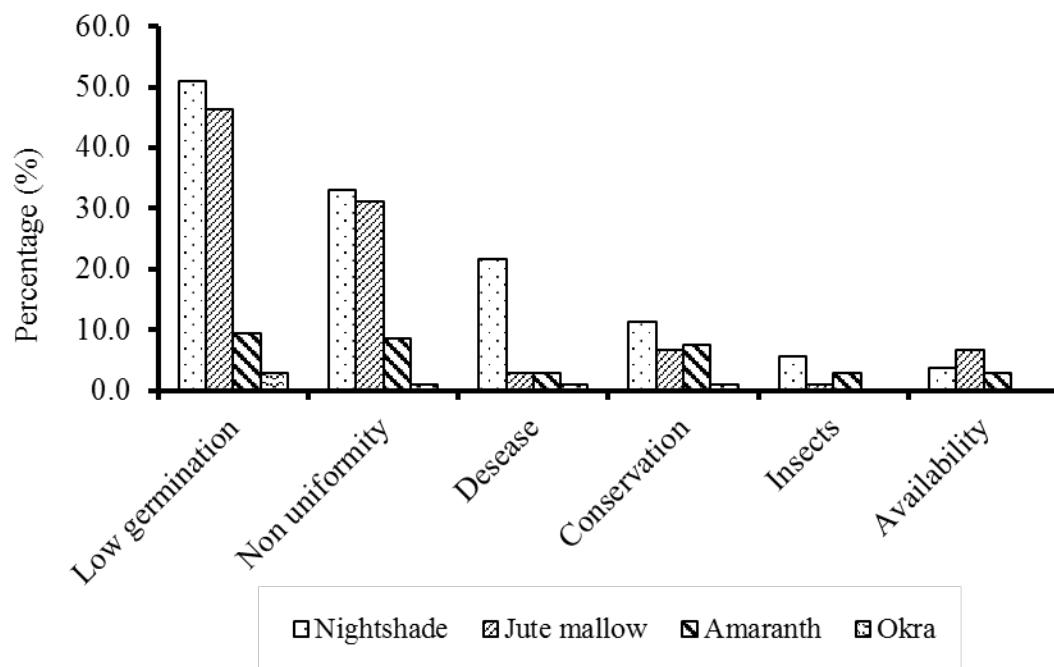


Fig. 4. Vegetables affected by the constraint identified.

DISCUSSION

Market gardening is an activity practiced mainly by women and youth. Studies have shown that women and young people in search of social and economic independence seek to overcome their adverse conditions by engaging in market gardening. Market gardening is a way to raise their purchasing power with regular income and also expand their power within the family [7, 8].

In Yaoundé, market gardening is where many traditional leafy vegetables are produced. The main traditional leafy vegetables grown are nightshade, amaranth and jute mallow. The survey revealed that consumer demand and the productivity of cultivars guide the choice of production of the producers. In a recent study conducted in Yaoundé, those vegetables: nightshade, amaranth and jute mallows are among the most consumed vegetables by all socio-economic groups [9]. Vegetables ensure a balanced diet for many consumers, adds great value to diets as they are rich in vitamins, iron, calcium and protein [10, 11]. Additionally, these vegetables have a short production cycle and their culture has a low demand for inputs [12, 13]. Moreover, the cultivars produced are generally well adapted to the immediate biotic and abiotic conditions [14].

The main source of seed supply is producers' own stock. This stock is produced by the producers and shared with neighboring producers and/or sold in the market. The seed production system remains informal. Very little commercial seed of traditional vegetable is used in this system. Trommetter *et al.* [15], working on indigenous crops, reported similar results. The authors explained that such seed production systems are mostly designed to satisfy the needs of producers. Thus, the production techniques are based on local indigenous knowledge.

Urban vegetable producers select and/or keep part of the production as seed for future planting. According to Moustier and David [13], seeds produced in this sector play a capital role because these farmers are maintaining crop diversity while storing and using traditional varieties. The authors also found that the small size of the available cultivated area per farmer justifies the seed system whereby the seed is produced and stored by farmers at a local level [15].

Storage methods used by the market gardeners of Yaoundé include conservation in plastic bags and tins or bottles hermetically sealed. The seeds are conserved for shorter durations from 3 to 12 months at the most. Seed conservation in hermetically sealed containers is a good method [16] that preserves seed viability and longevity. The method prevents seeds from absorbing moisture and losing their ability to germinate. Other studies have indicated that seeds can be stored in plastic bags, but for shorter periods, because plastics deteriorate seed quality [4]. This clearly indicates that the indigenous knowledge of the farmers is practical and suitable.

The low quality of seed produced (low germination of seed, non-uniformity and diseases susceptibility) may be caused by the fact the cultivars are not pure lines and no phytosanitary measures are taken by the producers. Lack of uniformity may have several causes including cross-pollination because the crops are not isolated [4]. Immature seeds, mechanical damage during extraction of seeds, seed moisture content, temperature and place of storage of seeds are other causes of non-uniformity of the seeds. In the tropics, seeds kept under natural conditions quickly lose their quality and vigor. Indeed, these seeds are exposed to several risk factors that promote physical, chemical and biological deterioration [17]. Lack of improved seed production technology is the reason for the poor quality of seed used for traditionally produced vegetables in the urban production system of Yaoundé.

The species most affected by bad quality factors are nightshade and jute mallow. These two species show higher levels of dormancy. That dormancy in nightshade is due to the use of inadequate extraction methods while the seed dormancy in jute mallow is caused by the impermeability of the mucilaginous coat surrounding the seed [5]. In a recent study conducted at AVRDC Cameroon, it was demonstrated in a laboratory test that pre-soaking seeds in hot or cold water significantly improved the germination percentage of jute mallow. A little sensitization/training of the producer could thus improve the seed system of the traditional vegetables.

CONCLUSION

This study on the supply of seeds for the production of traditional leafy vegetables identified the sources of seed supply and seed production systems in the peri-urban area of Yaoundé. A diversity of species is cultivated in the lowlands. Amaranth, nightshade and jute mallow are the most cultivated species. The main source of seed supply is farmer-produced seeds with traditional techniques of production and storage. Seed quality from this system is limited by several constraints including low germination, non-uniformity and diseases. The species most affected are nightshade and Jute mallow. This study calls for strengthening the technological capacity of the farmers regarding seed production in order to improve the seed production system of traditionally produced vegetables in the urban area of Yaoundé.

Table 1: Inland valleys in Yaoundé and the estimating degree of market gardening

Order	Name of the town	District in Yaoundé	Estimate degree of market gardening *	Area in hectare	Current status of gardening*	Number of persons surveyed
1	Cradat-olezoa	3	1	13.2	1	8
2	Quartier du Lac	3	1	14	0	-
3	Etam Bafia	4	1	14.2	0	-
4	Mendong	6	2	25.4	2	15
5	Kodengui	4	2	24.7	2	8
6	Oyom-Abang	7	2	20.9	2	15
7	Mballa	1	2	51.9	0	-
8	Nkolodom	1	3	14.3	3	24
9	Présidence Bastos	2	3	8.9	0	-
10	Ekounou/Ekomdoum	4	3	14.7	3	22
11	Nkolbisson	7	3	29.5	3	41

* : No activity : 0 Low activity : 1

Average activity : 2

High activity : 3

Source : TEMPLE-BOYER (2002).

Table 2: Sociodemographic characteristics of producers

Characteristics	Frequency	Percentage (%)
Number of producers	133	100
Number of women	86	64.7
Number of men	47	35.3
Married	85	63.9
Single	34	25.6
Widower	7	5.3
Divorced	5	3.8
Separated	2	1.5

Table 3: Inventory of vegetables

Types of vegetables cultivated			Number of respondents	Percentage (%)
Scientific name	Common name	Botanical family		
<i>Abelmoschus esculentus</i>	Okra	Malvaceae	48	36.1
<i>Solanum macrocarpon</i>	Leafy eggplant	Solanaceae	10	7.5
<i>Corchorus olitorius</i>	Jute mallow	Tiliaceae	112	84.2
<i>Solanum scabrum</i>	Nightshade	Solanaceae	130	97.2
<i>Amaranthus cruentus</i>	Amaranth	Amaranthaceae	131	98.5
<i>Vernonia amygdalina</i>	Bitter-leaf	Asteraceae	80	60.2
<i>Solanum macrocarpum</i>	Eggplant	Solanaceae	42	31.6
<i>Hibiscus sabdariffa</i>	Sorrel	Malvaceae	10	7.5

REFERENCES

1. **Nguegang A P** *L'agriculture urbaine et périurbaine à Yaoundé : analyse multifonctionnelle d'une activité montante en économie de survie.* Thèse de doctorat. Faculté des sciences, Université Libre de Bruxelles 2008 ; 161 p.
2. **Gockowsky J, Mbazo'o J, Mbah G and T Moulende** African leafy vegetables and the urban and peri-urban poor. *Food Policy* 2003; **28** (3): 221-235.
3. **Moustier P, Moumbele M and J Huat** La gestion concertée et durable des filières maraîchères urbaines. In: Olanrewaju B S, Moustier P, Mougeot LJA and Fall A, (eds). *Développement durable de l'agriculture urbaine en Afrique francophone. Enjeux, concepts et méthodes.* Cirad et Crdi, Paris, 2004 ; pp 79-114.
4. **Gregg BR and AJG Van Gastel** *Manuel de production de semences pour le secteur informel.* USDSAO/WASDU n° 15, Accra, 2003 ; 42 p.
5. **Abukutsa-Onyango M** Seed production and support systems for African leafy vegetables in three communities in Western Kenya. *African Journal of Food Agriculture, Nutrition and Development.* 2007; **7**(3): 1-16.
6. **Temple-Boyer E** *Dynamique de l'emprise spatiale et foncière de l'agriculture périurbaine et urbaine dans les bas-fonds de Yaoundé.* Rapport de DEA, Université de Paris I-UFR de géologie, Paris. 2002 ; 96 p.
7. **Tujague-Gibourg L** Le maraîchage en économie de plantation : une alternative à la crise sociale et économique ? *Afrique contemporaine* 2 (n°210), 2004 ; pp. 171-190.
8. **Fromageot A** Colonisation maraîchère des rives des petits barrages : une nouvelle géographie. In : Cecchi P, Lévêque C et Aubertin C (eds) *L'eau en partage : les petits barrages de Côte d'Ivoire.* IRD, Montpellier. 2007 ; pp 229-243.
9. **Kamga R, Kouame C and E Akyeampong** Vegetable consumption pattern in Yaoundé, Cameroon. Poster presented at the 19th International Congress of Nutrition: 4-9 October 2009, Thailand, Bangkok and at the 1st All Africa Horticulture Congress, Nairobi, Kenya. 31 August-3 September 2009.
10. **Kahané R, Temple L, Brat P and H De Bon** Les légumes feuilles des pays tropicaux : diversité, richesse économique et valeur santé dans un contexte très fragile. In : Parrot L, Temple L, Njoya A, Assogba-Komlan F, Kahané R, Ba Diao M, Havard M (Eds). *Études de cas de la dynamique du maraîchage périurbain en Afrique sub-saharienne.* Rapport FAO-CIRAD, Montpellier. 2005.

11. **Depezay L** *Les légumes dans l'alimentation : leurs effets nutritionnels.* Fondation Louis Bonduelle, Villeneuve d'Ascq. 2007.
12. **Moustier P and J Page** Le périurbain en Afrique : une agriculture en marge ? in : *Courrier de l'Environnement* n° 32. CIRAD, Montpellier, 1999.
13. **Moustier P and O David** *Études de cas de la dynamique du maraîchage périurbain en Afrique sub-saharienne. Rapport FAO-CIRAD,* Montpellier. 1996 ; 36 p.
14. **Kouamé C, Fondio L, Agbo E, Mahyao A. et JC N'ZI** *Potentiels des légumes feuilles dans la sécurité alimentaire et nutritionnelle des populations urbaines d'Abidjan et de Yamoussoukro.* Agronomie Africaine. 2010 ; In Press.
15. **Trommetter M, Vautrin MA and D Marie-Vivien** Les marchés de la biodiversité. In : Aubertin C, Pinton F, Boisvert V (Eds). *Les ressources génétiques pour l'agro-industrie : des échanges complexes.* IRD Paris, 2007 : 55-81.
16. **Sukprakarn S, Juntakool R, Huang R and T Kalb** *Comment produire et conserver ses propres semences de légumes – Un guide pour les producteurs.* AVRDC publication, Shanhua. 2006 ; 22 p.
17. **Westphal E** Les cultures maraîchères. In : Westphal E, Embrechts J, Fewerda JD, Van Gils-Meeus HAE, Mustsaers HJW, Westphal-Stevens JMC, (Eds). *Cultures vivrières tropicales avec référence spéciale au Cameroun.* Pudoc, Wageningen, 1985 : 321-363.