



SJIF Evaluation on Request

The Editorial Staff who decide to use of this option will receive the SJIF Value within 7 days.

SJIF Publishers Panel

Register journal - (Free Service)

in a scored and prestigious database of scientific journals.

Manage journal - (Free Service)

This section allows you to place information about the journal, editors, and publisher, etc.

International Journal of Advanced Engineering and Management Research

SJIF 2020:

Under evaluation

Area: Multidisciplinary

Evaluated version: online

Previous evaluation SJIF

2019: 5.627

2018: 4.897

2017: 4.304

2016: 3.379

The journal is indexed in:

SJIFactor.com

SJIF Journal Rank

Full list of journals from database of SJIFactor.com. It contains currently over **21000 journals** from all over the world.

Certificate

A proof of being indexed in SJIF Journal Rank List.


Evaluation methodology

FAQ

Basic information

Main title	International Journal of Advanced Engineering and Management Research
ISSN	2456-3676 (E)
URL	http://ijaemr.com
Country	 India
Journal's character	Scientific
Frequency	Bimonthly
License	Free for non-commercial use
Texts availability	Free

Contact Details

Editor-in-chief	Mr. Naresh Kumar  India
Publisher	Alicon Publications Usha Nagar Extension Indore, M.P., India

Journal's description

International Journal of Advanced Engineering and Management Research (IJAEMR) (ISSN 2456-3676) is a open access double blind peer reviewed bi-monthly e-journal, with a strong Editorial Board and a tested rapid peer review system.

ISSN: 2456-3676



International Journal of Advanced Engineering and Management Research

IJAEMR

Volume 4, issue 5, Oct 2019

19



()

[IJAEMR \(index.php\)](#)[Current Issue \(currentissue.php\)](#)[Archive \(archive.php\)](#)[Comité de rédaction \(editorial.php\)](#)[Instructions pour les auteurs \(instruction.php\)](#)[IJAEMR Sujets \(topics.php\)](#)[Mode de paiement \(modeofpayment.php\)](#)[Indexation \(indexing.php\)](#)[Formulaire de copyright \(images/Copyrightform.pdf\)](#)[Contactez-nous \(contact.php\)](#)

Journal international de recherche avancée en ingénierie et en gestion

ISSN: 2456-3676

Rédacteur en chef**Dr. Naresh kumar****Email- info@ijaemr.com****Dr.JIAN CAO**Professeur, Département de génie mécanique Vice-président associé pour la recherche Northwestern University, **USA** .**Courriel:** jcao@northwestern.edu **Voir le profil (resume/Cao-Jian-CV.pdf)**
(resume/Cao-Jian-CV.pdf)**Dr. Keran Song**Professeur, Département d'économie, Florida International University, Miami, FL, **Floride** .**Courriel:** keransong@gmail.com **Voir le profil (resume/Resume-Keran Song (1).pdf)**
(resume/Resume-Keran Song (1).pdf)**Dr. Arcione Ferreira Viagi**Université de Taubaté, Département de génie mécanique. Rua Colégio Nossa Senhora do Bom Conselho, Taubaté, SP - **Brésil** .

Courriel: afviagi@gmail.com **Voir le profil (resume/Curriculum System of Curriculum Lattes (Arcione Ferreira Viagi).pdf)**
(resume/Curriculum System of Curriculum Lattes (Arcione Ferreira Viagi).pdf)

Iosif Micea Neamtu

PhD en Cybernétique et Statistiques Economiques, Université Lucian Blaga, Roumanie.

Courriel: neamtu12@yahoo.com **Voir le profil (resume/Neamtu M.I._CV.doc)**
(resume/Neamtu M.I._CV.doc)

Dr.Madan Lal Bhasin

Professeur, École de comptabilité, Universiti Utara Malaysia (UUM) Malaisie .

Courriel: madanbhasin@uum.edu.my **Voir le profil (resume/Dr._Bhasin_BRIEF-CV-2015.docx)**
(resume/Dr._Bhasin_BRIEF-CV-2015.docx)

Dr. Kshitij Shinghal,

professeur associé (Département d'ingénierie E&C) et doyen associé, Moradabad Institute of Technology, Moradabad, Inde .

Courriel: kshinghal@gmail.com **Voir le profil (resume/Dr Kshitij Shinghal modified on 9.2.17.pdf)**
(resume/Dr Kshitij Shinghal modified on 9.2.17.pdf)

Dr Stanyo Neykov Dinov

LL.M. en droit des sociétés et en droit financier, Université de Heidelberg, Heidelberg, Allemagne

Courriel: stdinov@abv.bg **Voir le profil (resume/CV stanyo dinov..pdf)**
(resume/CV stanyo dinov..pdf)

Dr Pratap Chandra Mandal

PhD en marketing, Institut indien de technologie, Kharagpur, Inde

Courriel: pratap1124@gmail.com **Voir le profil (resume/cv_detailed_pratap.doc)**
(resume/cv_detailed_pratap.doc)

Dr. Visar Malaj

Post-doctorat en statistique appliquée, Université de Grenade albanais.

Courriel: visarmalaj@feut.edu.al **Voir le profil (CV 2016 november visar.pdf)**
(CV 2016 november visar.pdf)

Dr.R.Devi Priya

Département des technologies de l'information, Kongu Engineering College, Tamil Nadu, Inde.

Courriel: scrpriya@gmail.com **Voir le profil (resume/Curriculum Vitae Devi Priya.pdf)**
(resume/Curriculum Vitae Devi Priya.pdf)

Dr Teguh Sugiarto

Faculté de comptabilité de gestion, Université Brawijaya **Indonésie.**

Courriel: teguh_cpconsulting@yahoo.com **Voir le profil (resume/CV Teguh.doc)**
(resume/CV Teguh.doc)

Gosekwang Setibi

Management / Acting, Université du Botswana **Botswana.**

Courriel: gosekwang.setibi@mopipi.ub.bw **Voir le profil (resume/GOSEKWANG SETIBI CV.doc)**
(resume/GOSEKWANG SETIBI CV.doc)

Dr Rana Khudhair Abbas Ahmed

Phd Scholor, Collège universitaire Al-Rafidain, **Iraq.**

Courriel: rana_ruc@yahoo.com **Voir le profil (resume/rana cv - Copy.pdf)**
(resume/rana cv - Copy.pdf)

Salini Bafaneli

MSc Strategic Management, Université du Botswana, **Botswana.**

Courriel: salinibafaneli@yahoo.com **Voir le profil (resume/salini bafalini.docx)**
(resume/salini bafalini.docx)

Dr.SRBoselin Prabhu

Professeur adjoint en électronique et ingénierie de la communication, Tamilnadu, **Inde .**

Courriel: jcao@northwestern.edu **Voir le profil (resume/NEW RESUME dr BOSELIN.doc)**
(resume/NEW RESUME dr BOSELIN.doc)

Dr J. VIMAL PRIYAN Docteur

en gestion, Université Bharathiar, Coimbatore, **Inde.**

Courriel: vimalugc@yahoo.co.in **Voir le profil (resume/new biodata vimal PRIYAN.doc)**
(resume/new biodata vimal PRIYAN.doc)

Dr.Loc Nguyen

Postdoctoral de Philosophie en Mathématiques et Statistiques, Sunflower Soft Company, Ho Chi Minh ville, **Vietnam**

Courriel: ng_phloc@yahoo.com **Voir le profil (resume/cv Loc Nguyen.pdf)**
(resume/cv Loc Nguyen.pdf)

M. Christo Ananth

Professeur agrégé, Département d'électronique et d'ingénierie de la communication **Inde.**

Courriel: ping2christo@yahoo.com **Voir le profil (resume/Resume of Christo Ananth.pdf)**
(resume/Resume of Christo Ananth.pdf)

Dr.G.Rajini

Phd in Strategic Human Resource Management Management, VELS University, **India.**

Courriel: rajini.sms@velsuniv.org **Voir le profil (resume/Dr.G.Rajini CV.doc)**
(resume/Dr.G.Rajini CV.doc)

Ph.D. *

Département d'ingénierie **Kulkarni Vyankatesh Shrikant** , Université Shri Venkateshwara, Uttar Pradesh, **Inde** .

Courriel: vyankatesh_kulkarni66@rediff.com **Voir le profil (resume/Vyankatesh.doc)**
(resume/Vyankatesh.doc)

Siele Kiplangat Richard

PhD) en économie, Université Moi –Eldoret, **Kenya.**

Courriel: richardkiplangat@yahoo.com **Voir le profil (resume/Siele CV.doc)**
(resume/Siele CV.doc)

Dr Joseph Kiprono Kirui

PhD en gestion d'entreprise, gestion stratégique, Université Moi **Kenya.**

Courriel: mnyorokirui@gmail.com **Voir le profil (resume/CITATION ON DR KIRUI.doc)**
(resume/CITATION ON DR KIRUI.doc)

Mlle Arbanah Muhammad

Faculté de génie chimique Universiti Teknologi MARA (UiTM) Johor **Malaysia**

Courriel: arbanah7188@johor.uitm.edu.my **Voir le profil (resume/Resume_Arbanah.pdf)**
(resume/Resume_Arbanah.pdf)



()

IJAEMR (index.php)

Current Issue (currentissue.php)

Archive (archive.php)

Comité de rédaction (editorial.php)

Instructions pour les auteurs (instruction.php)

IJAEMR Sujets (topics.php)

Mode de paiement (modeofpayment.php)

Indexation (indexing.php)

Formulaire de copyright (images/Copyrightform.pdf)

Contactez-nous (contact.php)

Journal international de recherche avancée en ingénierie et en gestion

ISSN: 2456-3676

Indexage



([https://scholar.google.com/citations?](https://scholar.google.com/citations?hl=en&user=IB3UF74AAAAJ&view_op=list_works&gmla=AJsN-F5yrFC1vFkbzfcIZ4mIMVi8CBJxlkDSQT7E-I-C5LJTBjwxn6RJzKew_T0Wd8gUWciWn01jRHQHA-nzNKm0guWecp_qD29vANOzWS_BOOgd1m-GCEk)

[hl=en&user=IB3UF74AAAAJ&view_op=list_works&gmla=AJsN-F5yrFC1vFkbzfcIZ4mIMVi8CBJxlkDSQT7E-I-C5LJTBjwxn6RJzKew_T0Wd8gUWciWn01jRHQHA-nzNKm0guWecp_qD29vANOzWS_BOOgd1m-GCEk](https://scholar.google.com/citations?hl=en&user=IB3UF74AAAAJ&view_op=list_works&gmla=AJsN-F5yrFC1vFkbzfcIZ4mIMVi8CBJxlkDSQT7E-I-C5LJTBjwxn6RJzKew_T0Wd8gUWciWn01jRHQHA-nzNKm0guWecp_qD29vANOzWS_BOOgd1m-GCEk))



(<https://www.researchbib.com/view/issn/2456-3676>)



(<https://www.researchgate.net/>)



(https://business.academickeys.com/jour_main.php/jour_main.php)



(<http://www.i2or.com/8.html>)



([http://www.scopemed.org/?](http://www.scopemed.org/?term=International+Journal+of+Advanced+Engineering+and+Management+Research&area=journal&b1=Search+ScopeMed)

[term=International+Journal+of+Advanced+Engineering+and+Management+Research&area=journal&b1=Search+ScopeMed](http://www.scopemed.org/?term=International+Journal+of+Advanced+Engineering+and+Management+Research&area=journal&b1=Search+ScopeMed))



(<https://www.sindexs.org/JournalList.aspx?ID=3298/>)



([http://www.citefactor.org/journal/index/17061/international-journal-of-advanced-engineering-and-management-](http://www.citefactor.org/journal/index/17061/international-journal-of-advanced-engineering-and-management-research#.WQis89KGPDc)

[research#.WQis89KGPDc](http://www.citefactor.org/journal/index/17061/international-journal-of-advanced-engineering-and-management-research#.WQis89KGPDc))



(<http://www.directoryofscience.com/site/4549589>)



(<http://ulrichsweb.serialssolutions.com/>)



(<https://www.scribd.com/>)



(<https://journals.indexcopernicus.com/search/details?id=46451>)



(<https://issuu.com>)



(<https://www.ourglocal.com/>)



(<http://olddrji.lbp.world/JournalProfile.aspx?jid=2456-3676>)



([http://road.issn.org/issn/2456-](http://road.issn.org/issn/2456-3676-international-journal-of-advanced-engineering-and-management-research#.WgLEAY-CzDc)

[3676-international-journal-of-advanced-engineering-and-management-research#.WgLEAY-CzDc](http://road.issn.org/issn/2456-3676-international-journal-of-advanced-engineering-and-management-research#.WgLEAY-CzDc))



(<http://www.sjifactor.com/passport.php?id=20001>)



(http://creativecommons.org/licenses/by-sa/3.0/deed.en_US)

Sous licence Creative Common Attribute 3.0



()

IJAEMR

ISSN: 2465-3676

Volume 4, numéro 5, oct.2019

Titre de l'article et auteurs	Page	Télécharger
LES DESCRIPTIONS STATISTIQUES DES CARACTÉRISTIQUES SISMIQUES DE TAIWAN (link4.php?id=377) Ko-Ming Ni, Taiwan	01-26	PDF (uploads2019/IJAEMR_37)
LES CARACTÉRISTIQUES DES SÉRIES TEMPORELLES SISMIQUES ET LES PRÉVISIONS DES ÉMISSIONS D'ÉNERGIE MENSUELLES ET DES NOMBRES DE SÉISMES À TAIWAN (link4.php?id=378) Ko-Ming Ni, Taiwan	27-47	PDF (uploads2019/IJAEMR_37)
TENDANCE COMMERCIALE DE TAIWAN AVEC HUIT CONTINENTS ET PAYS EN ASIE (link4.php?id=379) Ko-Ming Ni, Taiwan	48-74	PDF (uploads2019/IJAEMR_37)
ANALYSES DE LA SÉRIE TEMPORELLE ET IDENTIFICATION DES MODÈLES DES VALEURS COMMERCIALES POUR TAIWAN (link4.php?id=380) Ko-Ming Ni, Taiwan	75-106	PDF (uploads2019/IJAEMR_38)
MODIFICATION DES CONTENUS EN GRAISSES SATURÉES ET TRANS ET LE PRIX DES PRODUITS DE COOKIES SUR LE MARCHÉ DE TAIWAN DE 2015 À 2018 (link4.php?id=381) Chuan-Yi Yeh, Taiwan	107-114	PDF (uploads2019/IJAEMR_38)
UNE PROPOSITION POUR UNE CONFIGURATION MISE À JOUR DE LA CHAÎNE DE VALEUR (link4.php?id=382) Prof. Dr. Gunter Hofbauer, Anita Sangl, Allemagne	115-134	PDF (uploads2019/IJAEMR_38)
CONCEPTION D'UNE MACHINE D'INJECTION AUTOMATIQUE DE (link4.php?id=383) TRONC BASÉE SUR LA LUTTE (link4.php?id=383) ANTIPARASITAIRE DES ARBRES (link4.php?id=383) Ma Chengzhang, Ji Desheng, Xing Luchao, Xu Chao, Zhang Qing, Chine	135-145	PDF (uploads2019/IJAEMR_38)
TRANSPORT ROUTIER DE MARCHANDISES SUR L'AXE DE LOME COTONOU (link4.php?id=384) Auguste T. HOUINSOU, ZINSOU CODOSEIGNON Magloire Francois, Bénin	146-154	PDF (uploads2019/IJAEMR_38)

Titre de l'article et auteurs	Page	Télécharger
TECHNOLOGIE VERTE ET ÉCONOMIQUE D'ÉNERGIE DANS LA RECONSTRUCTION DU VIEUX PORT: ÉTUDE DE CAS DE SHANGHAI (link4.php?id=385) Xuefeng Wang, Xingyu Jia, Pengcheng Wu, Tianrong Huang, Huixian Jiang, Chine	155-172	PDF (uploads2019/IJAEMR_38
PRODUCTION ET FOURNITURE DE FEUILLES DE LÉGUMES TRADITIONNELLES DANS LA VILLE DE COTONOU (link4.php?id=386) NASSI Karl Martial, MAGNON Zountcheqbe Yves, EFIO Sylvain, Bénin	173-184	PDF (uploads2019/IJAEMR_38



PRODUCTION AND SUPPLY OF TRADITIONAL VEGETABLE LEAVES IN THE CITY OF COTONOU

NASSI Karl Martial¹, MAGNON Zountchégbé Yves², EFIO Sylvain²

¹School of Horticulture and Spatial Planning (EHAEV), National University of Agriculture
(UNA), BP 43 Kétou, Benin

²Ecole of Economics, Socio-Anthropology and Communication for Rural Development / Faculty
of Agricultural Sciences / University of Abomey-Calavi (Benin)

ABSTRACT

The production and supply of traditional leafy vegetables has been studied in the city of Cotonou to contribute to a better knowledge of traditional leafy vegetables and their mode of production. Data were collected from socio-economic surveys based on structured interviews with three categories of actors, namely gardeners, traders and consumers. A total of 209 people were interviewed, including 130 traders, 39 consumers and 40 gardeners. Data were analyzed using descriptive statistical tools such as frequencies, response rates and averages. From the results obtained, it emerges that 06 main traditional leafy vegetables are grown in the city of Cotonou. Each gardener produces an average of 2016 m² of *Amaranthus cruentus*, 5424 m² of *Solanum aethiopicum*, 1362 m² of *Vernonia amygdalina*, 1548 m² of *Ocimum gratissimum*, 1020 m² of *Celosia argentea* and 360 m² of *Hibiscus sabdariffa*. Finally, the various supply routes for traditional leafy vegetables are the market garden sites, the small markets of the sub-municipalities of Cotonou, the markets of the municipalities bordering Cotonou such as Ouidah, Abomey-Calavi and Sèmè-Kpodji and the international market Dantokpa which feeds all local markets in the supply of traditional leafy vegetables.

Keywords: urban agriculture, market gardening, supply circuit, leafy vegetables, Cotonou.

1. INTRODUCTION

The African continent has a great diversity of food plants (Okigbo, 1977, Okigbo et al., 2000). These plant genetic resources are the basis of global food security. They are the raw material that farmers use to improve the quality and productivity of crops (FAO, 2000). Among these phylogenetic resources are traditional leafy vegetables (FAO, 2002). Traditional leafy vegetables are among the species of great diversity and multiple use (Attèrè, 1999). Thus, they play an important role in the diets of all populations in the world, particularly in Africa, Asia and Oceania, where they provide the bulk of nutritional and medicinal requirements (Batawila et al., 2005). In fact, traditional or indigenous leafy vegetables, as opposed to exotic vegetables from temperate countries, are generally richer in mineral elements, vitamins and nutritional factors, without presenting any crippling antinutritional factors (Bailey, 2003). In addition to being easily accessible to poor individuals and households, they generate income in a relatively short time compared to cereals (Margiotta, 1997). The uses of these species are also food and medicinal. It is undoubtedly for these various reasons that the International Institute for the Management of Phylogenetic Resources (IPGRI) has been concerned by the issue by organizing several international workshops on the subject and by setting up international research networks (Attèrè,

economic surveys were conducted using questionnaires and interview guides, which gathered the representations and practices of these three categories of actors. The interviews were all conducted individually. A total of 209 people were interviewed, including 130 shopkeepers, 39 consumers and 40 market gardeners. The information collected concerns the entire production and supply system, namely mainly cultivated and consumed products, cultural practices, production and supply routes and routes, the various categories of actors and the relations between them. existing between them.

The counting was done manually using the Excel spreadsheet. The results obtained were presented in the form of tables and graphs. Specifically for producers, response rates for indicators such as crop species, distribution of producers by age, sex, level of education and number of years of experience, calculated using the formula of Seastrom (2001):

$$T = \frac{S}{N} \times 100$$

With T: respondents' response rate (%), S: number of people who responded to a given activity and N: number of people interviewed

The data collected, cross-checked and analyzed, made it possible to highlight the phenomenon under study

3. RESULTS

3.1. Production of traditional leafy vegetables

3.1.1. Types of traditional leafy vegetables produced

In the city of Cotonou, 6 main traditional leafy vegetables are grown by market gardeners. It is: Amaranthus cruentus (Photo 1): It is one of the most cultivated vegetables on the market gardening sites of Cotonou. It exists in two forms, a red and a green; the last being the most frequent and the most cultivated. After two weeks of nursery, it is transplanted on boards already erected at 20 x 20 cm spacings. Its production time is 3 weeks. These boards are watered twice a day. Amaranth is harvested from one harvest per production cycle and is produced 8 times a year. Its harvest is done by tearing or by successive cutting of the plants. It should be noted here that unlike other traditional leafy vegetables, Amaranth is insensitive to gall-nematodes found in all soils of southern Benin (Photo 1).

Celosia argentea (Photo 2): It is one of the vegetables grown on the market gardening sites of Cotonou. It exists in two forms that are essentially distinguished by the type of leaves. After two weeks of nursery, it is transplanted on already erected planks at intervals of 10 times 10 cm to 20 times 20 cm. Its production time is 3 weeks. These boards are watered twice a day. Celosia argentea is subject to 02 harvests per production cycle and is produced 5 times a year. Its harvest is done by successive cutting of the plants.

Solanum aethiopicum (Photo 3): This vegetable is one of the most cultivated vegetables on the market gardening sites of Cotonou. After three weeks of nursery, it is transplanted on the boards already erected at larger spacings up to 50 times 50 cm. Its production time is two and a half months. These boards are watered twice a day and after two months, once a day. Solanum

aethiopicum is harvested 5 times per production cycle and is produced once a year. Its harvest is done by successive cutting of the plants.

Vernonia amygdalina (Photo 4): This vegetable is one of the most cultivated vegetables on the market gardening sites of the city of Cotonou. It is propagated by cutting (part of a plant that is planted with roots) on planks already erected at larger spacings up to 50 times 50 cm. Its production time is two and a half months. These boards are watered twice a day and after two months, once a day. It is harvested 5 times per production cycle and is produced once a year. Its harvest is done by successive cutting of the plants.

Occimum gratissimum (Photo 5): It is one of the most cultivated vegetables on the market gardening sites of Cotonou. After three weeks of nursery, it is transplanted on planks already erected at intervals of 40 times 40 cm. Its production time is two and a half months. These boards are watered twice a day and after two months, once a day. *Ocimum gratissimum* is also harvested 5 times per production cycle and is produced once a year. Its harvest is done by successive cutting of the plants.

Hibiscus sabdariffa (Photo 6): This is a vegetable grown on the market gardening sites of Cotonou. After 02 weeks of nursery, it is transplanted on the boards already erected at spacings of 20 times 20 cm. Its production time is two months. These boards are watered twice a day. *Hibiscus sabdariffa* is also harvested 3 times per production cycle and is produced twice a year. Its harvest is done by successive cutting of the plants.



Photo 1: *Amaranthus cruentus*



Photo 2: *Celosia argentea*



Photo 3: *Solanum aethiopicum*



Photo 4: *Vernonia amygdalina*



Photo 5: *basil welcome*



Photo 6: *Hibiscus sabdariffa*

3.1.2. Proportion by crop types

Figure 2 shows the proportion by crop type. From the observation of Figure 2, it appears that the most common leafy vegetables grown on market gardening sites by producers are: *Solanum aethiopicum* (19%), *Vernonia amygdalina* (19%), *Ocimum gratissimum* (19%), *Amaranthus*

cruentus (18%). Then come Celosia argentea (15%) and Hibiscus sabdariffa (12%). This state of affairs is explained by the fact that these vegetables are the most demanded by consumers.

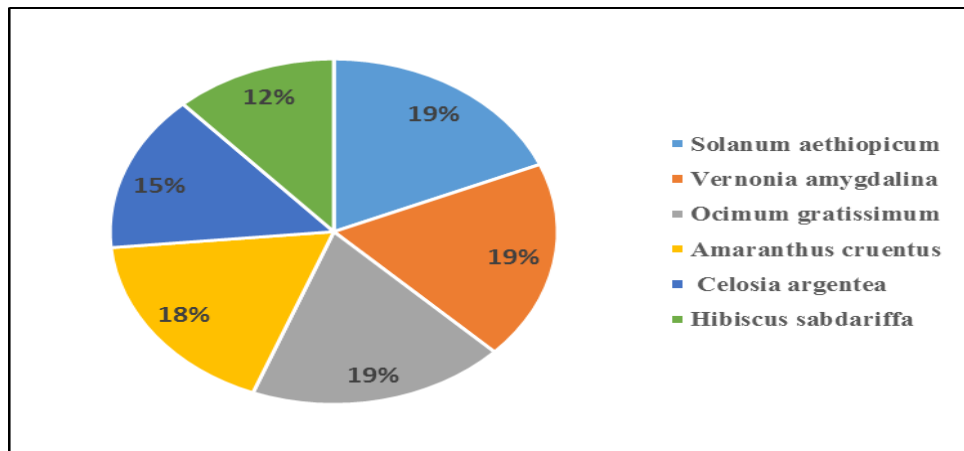


Figure 2: Proportion of producers by crop type
 Source: Field Survey, December 2018

4.1.3. Period of production and availability of traditional leafy vegetables

The production of leafy vegetables is possible throughout the year (Table I). The analysis of the table shows that during the small rainy season that runs from mid-September to mid-November, market gardeners produce a large amount of traditional leafy vegetables. This is related to the fact that in the rainy season, we witness the flood of the Ouémé river.

Table I: Agricultural calendar of traditional leafy vegetables

Month	J	F	M	A	M	J	Ju	A	S	O	N	D	
Climate Calendar	Dry season			Rainy season					Dry season				
Legend	Dry season					Rainy season							
Agricultural calendar	Amaranthuscruentus	Period of plenty			Period abundant					Poorly abundant period			
	Celosia argentea	Period of plenty			Period abundant					Poorly abundant period			
	Solanumaethiopicum	Period of plenty			Period abundant					Poorly abundant period			
	Vernonia tonsillitis	Period of plenty			Period abundant					Poorly abundant period			
	Ocimumgratissimum	Period of plenty			Period abundant					Poorly abundant period			
	Hibiscus sabdariffa	Period of plenty			Period abundant					Poorly abundant period			
Legend	Period of plenty			Period abundant					Poorly abundant period		Poorly abundant period		

Source: Field Survey, December 2018

4.1.4. Sociodemographic profile of production actors

On the market gardening sites, men are the most represented. This situation is linked to the unique land pressure linked to access to land suitable for market gardening activities in the city of Cotonou and in southern Benin in general (Figure 3). With regard to educational attainment, 30% of producers are uneducated, 40% have primary education, 20% have secondary education and 10% have tertiary level (Figure 4). As for age, 20% of producers are under 30, 47.5% are under 40, 22.5% are under 50, and 10% are under 60 years of age. This situation is linked to the fact that market gardening is mainly practiced by young people under the age of 40 (Figure 5). In terms of experience, 25% of traditional leafy vegetable growers have less than 10 years of experience, 40% have less than 20 years of experience, 20% have less than 30 years of experience and 15% have less than 40 years of experience. The predominance of young people in market gardening is explained by the fact that over 40 years of physical effort is no longer bearable by market gardeners (Figure 6).

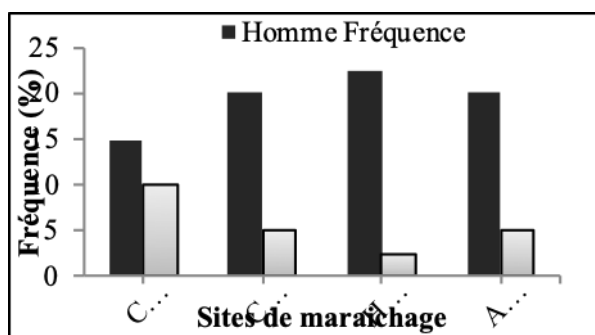


Figure 3: Distribution of producers by sex

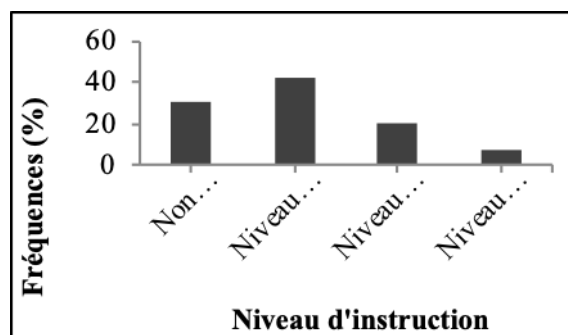


Figure 4 : Distribution of producers by level of education

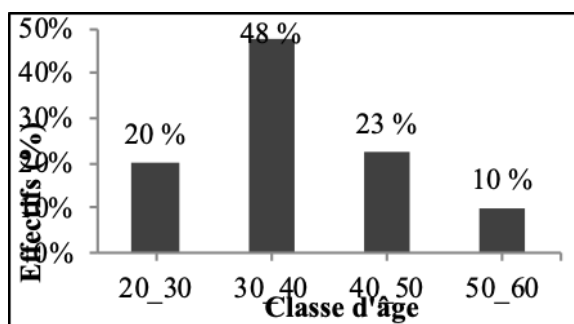


Figure 5: Distribution of producers by age group

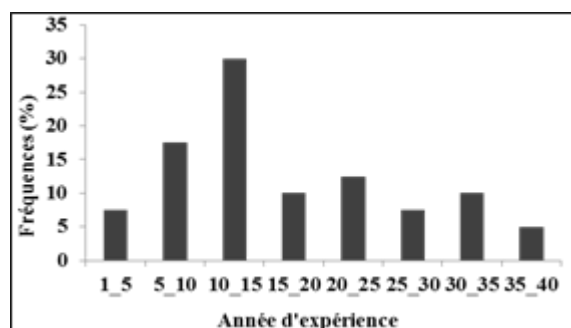


Figure 6: Producers' year of experience

Source: field survey, December 2018

3.2. Socio-economic aspects of production

4.2.1. Average cost of producing a traditional leaf vegetable board according to the seasons

The cost of producing a traditional leaf vegetable board, with an average surface area of 6 m², varies from one producer to another and from one site to another. This takes into account the

expenditures made, from seed supply to sale, ie the cost of seeds, labor and inputs. Table III shows the cost of producing a board. The analysis in Table II shows that the production cost of a plank of Vernonia amygdalina of Solanum aethiopicum of Hibiscus sabdariffa and Ocimum gratissimum varies from 500 to 1000 FCFA in the rainy season and is above 1000 FCFA in the dry season. Similarly, the production cost of a plate of Celosia argentea and Amaranthus cruentus is less than 500 FCFA in the rainy season and is between 500 and 1000 FCFA in the dry season.

Table II: Cost (FCFA) of production of a traditional leaf vegetable board

especies	Coût en saison pluvieuse (FCFA)			Cost in rainy season (FCFA) Cost in dry season (FCFA)		
	< 500	500_1000	> 1000	< 500	500_1000	>1000
Vernonia amygdalina	0,00	36,39	19,44	0,00	18,10	32,75
amaranth red	66,53	5,56	0,00	18,10	54,39	0,00
Solanum aethiopicum	0,00	36,39	25,69	0,00	18,10	47,72
Hibiscus sabdariffa	6,25	57,50	0,00	5,88	12,22	47,72
Celosia argentea	60,28	13,89	0,00	18,10	54,39	6,67
basil welcome	20,14	51,94	0,00	18,10	5,88	41,84

Source: Field Survey, December 2018

3.2.2. Evaluation of the production of traditional leafy vegetables

Amaranthus cruentus, Ocimum gratissimum, Vernonia amygdalina, and Solanum aethiopicum are the four most common traditional leafy vegetables grown in Cotonou. Solanum aethiopicum is a favored and highly valued vegetable for growers, as it is not only harvested multiple times per production cycle, but also has a higher selling price than other traditional leafy vegetable varieties. The traditional leafy vegetables are transplanted on planks of 6m long and 1m wide so on an area of 6m². The selling price of a traditional leafy vegetable board varies seasonally. The traditional leafy vegetable board is expensive during the short rainy season. This brings the market gardeners of the city of Cotonou to grow a large amount of traditional leafy vegetables at this time. Table IV shows the number of planks produced, the production cycle and the selling prices of a traditional leafy vegetable board.

The analysis in Table III shows that traditional leafy vegetables such as Solanum aethiopicum, Amaranthus cruentus, Ocimum gratissimum and Vernonia amygdalina are the most widely grown vegetables in Cotonou respectively. Hibiscus sabdariffa and Celosia argentea are the least cultivated. In addition, the board of traditional leafy vegetables are expensive in the rainy season than in the dry season.

Table III: Number of boards produced and selling price of a traditional leaf vegetable board according to the seasons in FCFA

LFT	NDPCP	NPA	SP (m ²)	STAP (m ²)	PVPSP	PVPSS
<i>Amaranthus cruentus</i>	42	336	6	2016	987,75	754
<i>Celosia argentea</i>	34	170	6	1020	945,5	851,75
<i>Hibiscus sabdariffa</i>	30	60	6	360	1124,75	891,25
<i>Ocimum gratissimum</i>	258	258	6	1548	1204	1024,75
<i>Solanum aethiopicum</i>	452	904	6	5424	2437,25	1999,75
<i>Vernonia amygdalina</i>	227	227	6	1362	1274,75	1099,75

Legend: NDPCP = Number of boards per production cycle; NPA = Number of boards per year; PVPSS = Sale price of a vegetable board X in dry season in FCFA; PVPSP = Sale price of a vegetable board X in rainy season in FCFA; SP = Area of a board; STAP = Total annual area of planks

Source: Field Survey, December 2018

3.3. Supply circuit of traditional leafy vegetables

Traditional leafy vegetables follow a journey of exploitation in the hands of consumers through different circuits. These traditional leafy vegetables come from the various market gardening sites in the city of Cotonou for the local markets of the city. The tradesmen come to stock up in the gardens. Market gardening sites are generally located close to markets, resulting in low transport costs and easier access. Traditional leafy vegetables that are not cultivated in Cotonou like *Talinum triangulare*, *Vigna unguiculata*, *Manihot esculenta*, *Vitex doniana*, *Moringa oleifera*, *Ipomoea batatas*, *Launaea taraxacifolia* come from the following localities, more or less distant: Cocodji, Hevié, Abomey, Ouidah, Pahou and Dogbo. These vegetables are also sourced from the large international Dantopka market, which supplies all local markets in Cotonou with traditional leafy vegetables. Merchants are forced to move to these different places. These supply areas are more than 25 km distant for Pahou, 41 km for Ouidah, 139 km for Abomey, 124 km for Dogbo, 15 km for Hevié. Figure 7 shows the different supply routes for traditional leafy vegetables in the local markets of the city of Cotonou.

The analysis in Figure 7 shows that the traditional leafy vegetables that are marketed in the local markets of the city of Cotonou come from the various market gardening sites of the city and the following surrounding localities like Cocodji, Hevié, AbomeyCalavi, Ouidah, Pahou and Dogbo.

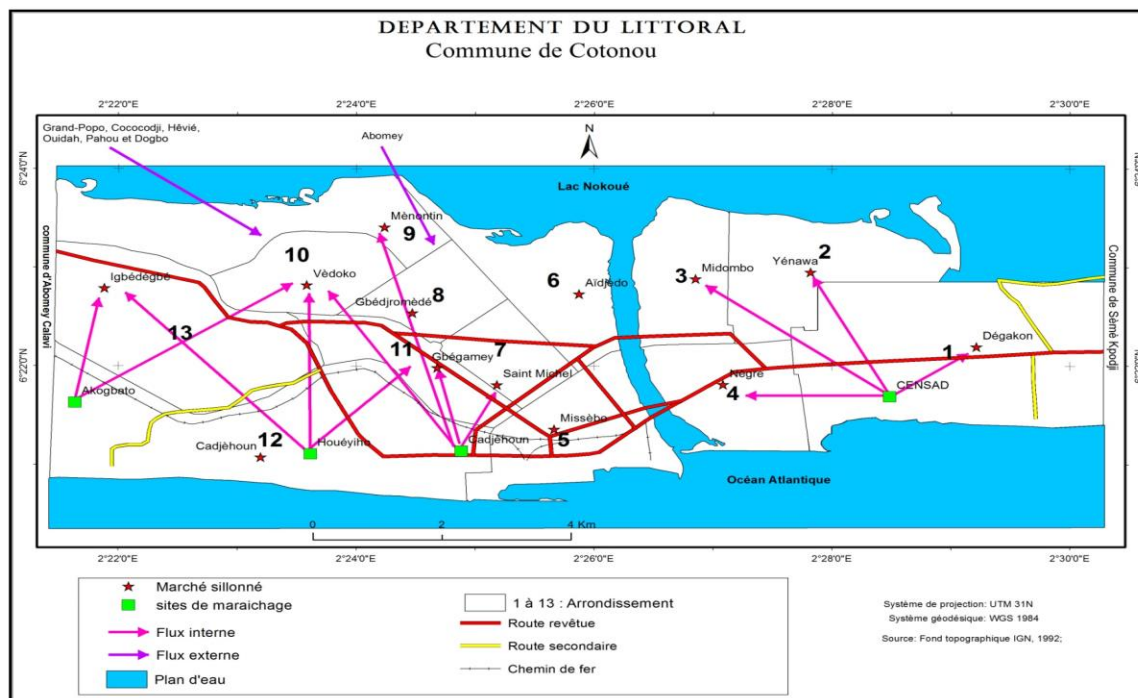


Figure 7: Carte du circuit d'approvisionnement en légumes feuilles traditionnels

Figure 7: Map of the traditional leafy vegetable supply circuit

4. DISCUSSION

Although seasonal, the production of traditional leafy vegetables occupies a significant number of the active population of Cotonou. Market gardening is a generator of jobs and income and solves enormous problems of unemployment and food insecurity faced by the population. This trend confirms the socio-economic surveys conducted in 2000 by the Market Gardening Support Project in southern Benin, which show that around 85,000 direct and indirect jobs were created in the market gardening sector in this region of the country (PDAF, 2000). Traditional leafy vegetables contribute to the development of households by the income they earn from them. Similarly, they allow households to feed themselves throughout the year. These results confirm the studies carried out by Margiotta (1997) who also show that market gardening activities can feed families all year long, since the supply period for leafy vegetables is longer for urban agriculture. that is 9 months out of 12. In Cotonou, women are poorly represented in traditional leafy vegetable producers. This is linked to the strong pressure on the land that leads to their virtual exclusion from access to land in this area. In addition, 40% of producers have primary level. This is explained by the fact that in Cotonou, market gardening absorbs some of the school dropouts. Thus, 47.5% of producers are under 40 years of age. In terms of experience, 40% have less than 20 years of experience. This is explained by the fact that beyond 40 years the physical effort is no longer bearable by market gardeners. These results confirm those of Adegbola, (2007) who reveal that market gardening is an activity practiced by young people. A total of 06 traditional leafy vegetables are grown on the Cotonou market gardening sites. These are:

Amaranthus cruentus grown by 18.78% of producers, Solanum aethiopicum 18.78%, Vernonia amygdalina 18.78%, Ocimum gratissimum 18.78%, Celosia argentea 15.02% and Hibiscus sabdariffa 9.86 %. This variation is probably related to the preference diversity of consumers, prices and seasonality of traditional leafy vegetables. Before the cultivation of traditional leafy vegetables, the market gardeners of the city of Cotonou proceed first to the realization of a nursery that they cover with branches. This confirms the research work of Mitchozounou (2008) who claims that market gardeners make a nursery that he covers with branches, and a few weeks after sowing, the young seedlings are transplanted onto planks. Vernonia amygdalina, Ocimum gratissimum and Solanum aethiopicum are produced once a year and have 5 crops per production cycle. Amaranthus cruentus is a single crop and is produced 8 times a year. Hibiscus sabdariffa is produced twice a year and has 3 crops per production cycle. Celosia argentea is produced 5 times a year and has 2 crops per production cycle. This is due to the fact that the production cycle of traditional leafy vegetables varies from one vegetable to another. Generalized soil infestation by root-knot nematodes makes susceptible except Amaranthus cruentus. These nematodes significantly weaken the plants and reduce their production. This trend confirms the results of Amoussougbo's (1993) research, which shows that all species are susceptible to root-knot nematodes except Amaranthus cruentus. Soil fertilization is done with NPK fertilizer and urea with and / or compost and poultry droppings. These results are consistent with that found by Lanmafankotin (2007) which shows that soil fertilization is done with NPK fertilizer and urea. The inputs used by producers come from the input market. Similarly, the seeds used by traditional leafy vegetable growers come from their own plantation and those of their friends or neighbors. These results are consistent with those of Seck (1997) who showed that in many African countries, self-production remains the main means for producers to use in terms of seed supply. In addition Cotonou market gardeners use pesticides to fight against certain pests and diseases of crops. These results are in line with that of (Assogba, 2001) which states that in the Atlantic and Littoral Departments, more specifically in the city of Cotonou, cypercal is one of the insecticides used to protect vegetable crops. In Cotonou, the doses of pesticides applied by treatment are generally higher than those recommended (Attèrè, 1999). The watering of crops is done by the watering can by 82% of producers and 18% of producers

CONCLUSION

This study, conducted in the city of Cotonou looked at three categories of actors namely market gardeners, shopkeepers and consumers. Men are at the center of activities related to the production of traditional leafy vegetables. The rate of intervention of women in the production of traditional leafy vegetables is low. Among the traditional leafy vegetables that are marketed in the local markets of the city of Cotonou, 6 traditional leafy vegetables are grown by the market gardeners in Cotonou. These are: Amaranthus cruentus, Celosia argentea, Solanum aethiopicum, Vernonia amygdalina, Ocimum gratissimum and Hibiscus sabdariffa. The different circuits of origin of the traditional leafy vegetables in the local markets of the city of Cotonou are Cococodji, Hevié, Abomey, Ouidah, Pahou, Dogbo, as well as international market Dantokpa which also supplies all the local markets with traditional leafy vegetables. The surrounding

municipalities are not neglected in terms of supply of the city of Cotonou and must be taken into account in all programs to promote this activity in the country's economic capital.

BIBLIOGRAPHIC REFERENCES

- Adegbola P., 2007. Production and marketing of local vegetables in urban and peri-urban areas in Benin: 21-29 p.
- Adjatin A., 2006. Contribution to the study of the diversity of traditional leafy vegetables consumed in the department of Atacora in Togo: 19-31 p.
- Amoussougbo Y., 1993. Survey on the use of pesticides in vegetable crops in southern Benin and experimentation of three nematicides in the control of root-knot nematodes. Thesis of Agricultural Engineer, Faculty of Agricultural Sciences, UNB-Benin: 50 p.
- Assogba F., 2001. Preliminary results on the valorization of some agroindustrial waste in market gardening, Case of the city of Cotonou. In: Proceedings of the Scientific Workshop 2, South-Central Regional Program of Benin, 2001: 16-26 p.
- Attere F., 1999. Introductory Note to the Workshop on Traditional Leafy Vegetables: 71 p.
- Batawila, K., S. Akpavi, K. Wala, M. Kanda, R. Vodouhe, K. Akpagana, 2005: Diversity and management of picking vegetables in Togo. In african journal of food agriculture nutrition and development. 21 p.
- Bailey., 2003: Medicinal use of traditional leafy vegetables: 87 p.
- Chidikofan., 2007: Soil management study: Case of the city of Cotonou: 28 p.
- ChweyaJ.A., AndEyaaguire P., 1999. International plant genetic resources institute via delle settechiese: 122 p.
- Dansi S., 2008. Biodiversity of traditional leafy vegetables consumed in Benin: 92 p.
- Diouf O., 2007. Biodiversity of traditional leafy vegetable in Senegal: 170 p.
- Eyaaguire P., 1999. The biodiversity of traditional leafy vegetables, IGRI Rome (Italy): 68 p.
- FAO, 2000. The State of Food and Agriculture: 59-74 p.
- FAO, 2002. Urban and peri-urban agriculture. Virtual conference: 102 p.
- FAO., 1996. Expanding the food resource base through native plants: 68 percent.
- Hessou., 1995. Support for the intensification and production of vegetable and fruit crops. Study of strategies to develop nutritionally. FAO / TCP / BEN / 4553 (A), MDR, Benin.
- Kpèki A., 2008. The cultivation of amaranth: tropical leaf vegetable: 27 p.

- Lanmafankotin G., 2007. Fight against poverty in Benin: the market gardening program and its impact on the urban environment: 35-52 p.
- Margiotta M., 1997. Development of production in the urban and peri-urban perimeters of Mauritania: 61 p.
- Mbaye., 2000. Plan for promoting vegetable and fruit crops in Benin. FAO / TCP / BEN / 4553.
- Mitchozounou M., 2008. The cultivation of amaranth in Cotonou 19-31 p.
- Okigbo. 1977. Vegetables in tropical Africa. A paper presented at a consultation meeting, Arusha, Tanzania 133 p.
- Okigbo et al., 2000. Contribution to the study of the diversity of traditional leafy vegetables consumed in the Atacora department of Togo: 111 p.
- PDAF., 2000. Feasibility study: market gardening project in southern Benin 230 p.
- Sanny S., 2002. Contribution to the improvement of yields and the quality of vegetable crops (detection of biocontaminants and toxic agents): Case of the market gardening perimeter of Houéyiho in Cotonou. Memory for obtaining the Engineer's Diploma of Works. CPU / UAC, Benin.
- Seastron., 2001: Response rate as a data quality management tool. Proceedings of the 2001 Statistics Canada Symposium 324 p.
- Seck., 1999. Traditional Leaf Vegetables: An Irreplaceable Food Supplement 53 p.
- Stevens H., 1990. Leaf vegetable from Cameroon: An agrobotanical study: 52-97 p.
- Tim H., 2005. Using Traditional Leafy Vegetables to Improve Soil Quality: 96%
- Tyrilly D., 1999. Technology of traditional leafy vegetables: 24-57 p.