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Conseil Scientifique de l'Université d'Abomey-Calavi

Tél : (229) 21 36 0074 : Fax (229) 21 36 00 28

E-mail : vrru.uac@uac.bj

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## **BARRIERS AND OPPORTUNITIES FOR VEGETABLE PRODUCTION AROUND AGRO-PASTORAL DAMS IN NORTHERN BÉNIN : RESULTS OF ADIAGNOSTIC STUDY**

**Kpéra<sup>a</sup> G.N., Segnon<sup>b</sup> A.C., Saïdou<sup>c</sup> A. & Kossou<sup>d</sup> D.K.**

<sup>a</sup>*Kpéra Gnanki Nathalie, Corresponding author: Institut National des Recherches Agricoles du Bénin/INRAB & Laboratoire d'Ecologie Appliquée, Faculté des Sciences Agronomiques, Université d'Abomey Calavi, BP 01 526 RP Cotonou, Bénin,*

*Tel.: +229 97127976; Fax: +229 21303084, e-mail: nathbiche@gmail.com*

<sup>b</sup>*Segnon Alcade Christel, Département de Production Végétale, Faculté des Sciences Agronomiques, Université d'Abomey Calavi, Bénin, e-mail : alcadese@yahoo.fr*

<sup>c</sup>*Saidou Aliou, Département de Production Végétale, Faculté des Sciences Agronomiques, Université d'Abomey Calavi, Bénin, saïdou.aliou@lycos.com*

<sup>d</sup>*Kossou Dansou, Département de Production Végétale, Faculté des Sciences Agronomiques, Université d'Abomey Calavi, kossoudansou@yahoo.com*

### **Abstract**

Vegetable production around agro-pastoral dams in northern Benin plays an important role in local people's diet and contributes to their livelihood. This study aims at characterizing vegetable farming systems and addressing people's perception on the silting up of agro-pastoral dams. Surveys were made on 70 vegetable farmers using semi-structured interviews, focus group discussion, and participant observations. 72.86 % of women are involved in vegetable farming around agro-pastoral dams. They belong to an association but work individually in their farms. A great variety of vegetables is grown, amongst which the most common are: red amaranth, sesame, okra, tossa jute, hot pepper, African eggplant, roselle, silver cock's comb, wild cabbage, lettuce, tomato, carrot and onion. To fertilize the soil animal manure is used by 61% of the respondents; 39% use the mineral fertilizers N-P-K (i.e. nitrogen (N), phosphorus (P), and potassium (K) because these are considered to be more effective than animal manure. Constraints impeding vegetable production in northern Benin consist of: difficulties to access to water during the dry season, pest management, damage caused by livestock, and lack of seeds, specific fertilizers and pesticides. Erosion, access by livestock to all sides to dams, and cropping systems around dams are perceived by local people as the most practices contributing to the silting up of dams. The challenge is thus to find innovative ways to optimize vegetable production from the perspective of integrated water resources management by lifting the constraints and capturing the opportunities.

Key words: vegetable farming, cropping system, constraints, silting up, pollution, Benin

## **Introduction**

Vegetable (leafy and fruits) are widely cultivated in most parts of sub Sahara Africa, as a cheap and reliable source of protein, vitamins, zinc and iron. They constitute between 30% and 50% of iron and vitamins A in resource poor diet (Sabo and Zira, 2009) and contribute to the prevention of nutritional deficiency diseases (Capo-Chichi et al., 2009). Vegetable production as remarkable source of income and in attaining food security has been a focal point in agricultural development plan in sub Sahara Africa (Sabo and Adeniji, 2007). In Bénin, vegetable production is met in all regions, contributing about 15 % to the national wealth and using about 4 % of the active population (Houngue and Kindomihou, 2009). In southern where vegetables are the most produced, this activity is localized in urban and peri-urban areas and in Ouémé valley (Adorgloh-Hessou, 2006). Dry season vegetable production constitutes a source of livelihood for resource poor farmers living in the cities. In northern vegetable production is along the banks of rivers that cut across cities and towns, inundated lands closer to cities or towns and around permanent water reservoirs of which agro-pastoral dams or waterholes. It is carried out especially by women, who generally work in an association, commonly known as 'Women's association' (Kpéra, 2009).

Like in others African countries, dry season vegetable production in Bénin, has been on going these last years supplying increasing food needs and providing employment and income for the increasing population (As-sogba-Komlan et al., 2007; Odjo et al., 2011). However, production is slow down by many socio-economic, technical and institutional constraints such as lack of capital, land tenure problem, pest and disease management and water-control (Singbo and Nouhoeflin, 2004; Kpéra, 2009; Segnon, 2011). These manifest as reduced or lost yield and low income, insufficient and irregular vegetables supply (Tiamiyou and Sodjinou, 2003) and prices' speculation in a certain period of the year (Capo-Chichi et al., 2009). Therefore, it is pertinent to understand constraints faced by vegetable farmers, especially those around agro-pastorals dams, in production and management. In adding, none or very little studies were interested, generally speaking, in vegetable production in northern Bénin, and espe-

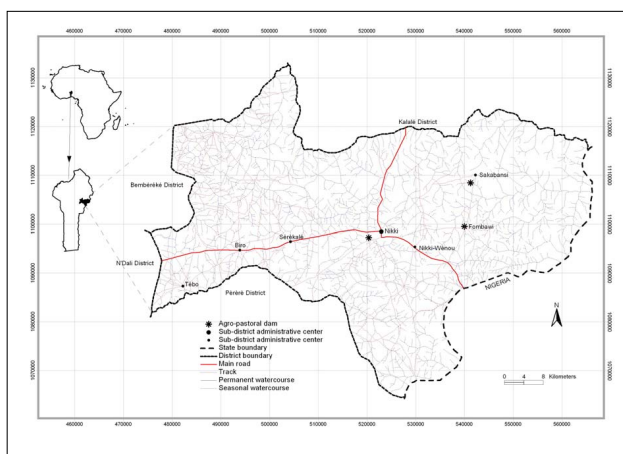
cially around agro-pastoral dams. Thus, this study comes at the appointed time to fill a gap of lack of adequate research information. It will also contribute to a development of participatory and sustainable agro-pastoral water's management strategy and farming systems in a perspective of integrated water resources management in waterholes (Segnon, 2011). This diagnostic study is undertaken to assess and describe vegetable production systems around agro-pastoral dams in Nikki Municipality and evaluate vegetable farmers' perception and knowledge on agro-pastoral dams silting up. Specifically, the study aims to: (i) determine socio-economic characteristics of vegetable farmers around dams; (ii) describe agronomic practices and characterize vegetable production systems around dams; (iii) identify constraints faced by vegetable farmers around dams and (iv) assess vegetable farmers' perception and knowledge on the silting up agro-pastoral dams.

## **Methodology**

The study was carried out from December 2010 to February 2011 in Nikki Municipality located in the Borgou District in North-Eastern Bénin. Nikki Municipality is roughly located between latitudes 9°40' to 10°15'N and longitudes 2°47' to 3°37'E. It is bounded to the North by Kalalé Municipality, to the South by Pèrèrè Municipality, to the East by Federal Republic of Nigeria and to the West by Bembèrèkè and N'Dali Municipalities (Figure 1). It covers an area of 3,171 km<sup>2</sup> and houses 20 agro-pastoral dams (CeCPA Nikki, 2010). The climate is the Guinea-Sudan type with two distinct seasons: one wet season from May to October and one dry season from November to April. This area is characterised by two types of wind chronologically established in time with variable speeds: maritime wind and harmattan. Maritime wind blows from April to November from a south western direction. A dry wind from the Sahara, called harmattan, blows from December to March (Sinsin, 1993). It is especially in dry season, where vegetable production around agro-pastoral dams is favourable that waterholes are invaded by livestock (of locals and transhumance herdsman) for watering (Segnon, 2011). The annual precipitation varies from 1,100 to 1,300 mm with a maximum between August and September (CeCPA Nikki, 2010). The annual temperature ranges from 26 to 37°C with a minimum in the period December to February (in harmattan) and average of 28°C. The vegetation consists mainly of savannah and riparian forests along rivers.



The locations studied were Nikki, Fombawi and Sakabansi (Figure 1). Their selection was based on the availability of information from previous studies (Kpéra, 2002; Kpéra, 2009) and they are noted for cultivation of vegetables around dams that they house. Proportion of respondents depends on farmers' availability and the importance of vegetable production. A purpose sample (Lefrançois, 1991) of 70 vegetable farmers around dams was selected as a sample frame for the study. Non-standardized and semi-structured interviews with individual farmers, farmer organizations and key informants (researchers, project workers, representatives of NGOs, dams' management team and extension agents) were used in data collection. Some of the issues addressed by the questionnaire include socio-economic parameters, agronomic practices, vegetables grown, sources of water, irrigation methods, soil fertility and pest management practices, constraints to vegetable production around agro-pastorals dams and farmers' perceptions of dams silting up. Field observations were used to supplement and validate the data collected and the information gathered during the group discussions. Data collected were summarized and analyzed using descriptive statistics (percentages, means, and frequency) and item analysis method (ranking, and problem analysis). Tables were used in data presentation.



**Figure 1.** Location of Nikki, Sakabansi and Fombawi agro-pastoral dams (Source : Designed by Kpéra G.N., 2010)

## **Results and Discussion**

### *Socio-economic characteristics of vegetable farmers around agro-pastoral dams*

The socio-economic characteristics of the farmers interviewed are presented in Table 1. It shows that majority (72.86 %) of the farmers involved in vegetable production around agro-pastoral dams in the study area are of the female sex, and to a large extent (80 %) are married. This indicates the preponderance of the female sex in vegetable production around dams in the region. This finding deviates from findings of Simeni Tchuente (2005) in urban and peri-urban zones of Djougou (Northwestern Bénin) and Assogba (2007) and Fanou (2008) in southern Bénin in which they reported the preponderance of men in vegetable production. In the same way, Sabo and Adeniji (2007), Sabo and Zira (2009), Oruonye (2011) and Adebisi-Adelani et al., (2011) reported that dry season vegetable farming (Fadama) are male dominated respectively in Northeastern, Southeastern and Southwestern Nigeria. However, men are more involved in vegetable production around dams in Nikki (48.65 %), which is administrative center of the municipality, than the other locations (which are rural areas). This is in line with conclusions of Assogba (2007) and Oluoch et al., (2009) in which, in rural areas, vegetable production and marketing is undertaken mainly by women. In addition, Jansen van Rensburg et al., (2007) noted that as soon as cash generation potential of the crop increases, men become more involved, as is the case with many other natural resources. This may be one of the reasons why more men are involved in production activities in urban and peri-urban areas, while marketing is still left to women.

It also comes from the Table 1 that majority (74.29 %) of vegetable farmers interviewed is illiterate with no formal education and most of them (70 %) don't have any training in vegetable farming working on the basis of their experience and intuition. The low level of education of majority of the farmers makes them lack basic knowledge of crop water requirement, irrigation scheduling and skills in maintaining and operating irrigation systems. These affect the productivity of the systems, as the crops are either over- or under irrigated, leading to wastages of the little available water and irrigation farmland (Oruonye, 2011). In addition, education has been shown to be a factor in the adoption of modern farm practices. It is generally considered an important variable that could enhance farmers'

adoption of new technology (Nwalieji and Ayayi, 2009). This must be taken into account for proposal of any vegetable production technology to improve their production; vegetable technology information must be communicated in clear and simple language, and must be easily adoptable.

Majority of the respondents (90 %) indicated that they were part time vegetable farmers who augment their primary income from off-season vegetable production. And in terms of occupation, different categories of actors are involved in vegetable production around agro-pastorals dams. There are farmers, traders, students, herders, craftsmen, public servants, worker (skilled or not) and people who has dropped out of the school system. Majority (54.28 %) of the respondents were between 30 and 50 years of age, while 21.43 % were within the age range of 16-30 years. The implication of this finding is that most of the respondents were at their middle age. Thus, they would still be active in production for a long time. These are in line with findings of Nwalieji and Ayayi (2009) and Odjo et al., (2011) in similar studies among vegetable farmers in respectively southern and southwestern Nigeria. The table also indicates that majority of the vegetable farmers at Nikki inherit their farm land, while at Fombawi and Sakabansi, farm land is the property of the community (village); they have been granted it by the chief of the village. The implication of this finding is that tenure insecurity doesn't represent a constraint for vegetable production as it is in southern Bénin reported by Assogba (2007).

**Table 1.** Socio-economic characteristics of the vegetable farmers around agro-pastoral dams

Socio-economic parameters	Location			
	Nikki (n=37) <sup>1</sup>	Fombawi (n=15)	Sakabansi (n=18)	Total (n=70)
	------(%)-----			
<b>Gender</b>				
Female	51.35	100	94.44	72.86
Male	48.65	0.00	5.56	27.14
<b>Age (year)</b>				
16 - 30	35.14	6.67	5.56	21.43
30 - 50	40.54	60.0	77.77	54.28
> 50	24.32	33.33	16.67	24.29
<b>Marital status</b>				
Single	16.22	0.00	0.00	8.57
Married	64.86	93.33	100	80.0
widowed	18.92	6.67	0.00	11.43
<b>Educational level</b>				
Illiterate	62.16	93.33	83.33	74.29
Koranic	5.41	6.67	11.11	7.14
Primary	18.92	0.00	5.56	11.43
Secondary	13.51	0.00	0.00	7.14
<b>Experience in vegetable farming</b>				
1 - 10	67.57	60.0	72.22	67.14
11 - 15	21.62	30.0	27.78	27.14
16 - 25	10.81	0.00	0.00	5.72
<b>Nature of farming</b>				
Part-time	86.49	100	88.89	90.0
Full-time	13.51	0.00	11.11	10.0
<b>Land tenure</b>				
Inheritance	94.6	0.00	0.00	50.0
Pc <sup>2</sup>	0.00	100	94.44	45.71
Loan	5.4	0.00	5.56	4.29
<b>Training in vegetable farming</b>				
Yes	16.22	60.0	33.33	30.0
No	83.78	40.0	66.67	70.0

<sup>1</sup> Number of respondents, <sup>2</sup> Property of the community

### *Agromomic practices in vegetable production around agro-pastoral dams*

Several crops are grown around agro-pastoral (Table 2). The major crops cultivated were amaranth (*Amaranthus cruentus*), sesame (*Sesamum indicum*), okra (*Abelmoschus esculentus*), pepper (*Capsicum frutescens*), jute (*Corchorus olitorus*), lettuce (*Lactuca sativa*), tomato (*Lycopersicon*

esculentum), roselle (*Hibiscus sabdariffa*), cabbage (*Brassica oleracea*), and African eggplant (*Solanum macrocarpon*). It's noticed that it's mostly question of leafy vegetables. This group constitutes the bulk of the African Indigenous Vegetables used throughout the continent (Shackleton et al., 2009). They are dominated by such plant families as those of the amaranth (*Amaranthaceae*), tomato (*Solanaceae*), sunflower (*Asteraceae*), pumpkin (*Cucurbitaceae*), cabbage (*Brassicaceae*), bean (*Fabaceae*) and jute (*Tiliaceae*).

It also appears from the Table 2 that amaranth is vegetable the most cultivated while African eggplant is the least cultivated. This finding is not in line with conclusions of Assogba-Komlan et al. (2007) in which they have identified African eggplant as vegetable the most cultivated in southern Bénin followed amaranth. The leaves of okra are much less important as a vegetable than the fruit, although their use is widespread in most villages. The leaves are commonly consumed like spinach (Ndanikou et al, 2009), and occasionally are sold in local markets (Maundu et al, 2009). Fruits are usually consumed by all sociolinguistic groups, as a sticky soup. Its can be dried and reduced in powder for conservation (Ndanikou et al, 2009).

Most of the farmers interviewed (57.14 %) source seeds from field produce. But in Nikki, the urban area, farmers mostly (43.24 %) import seeds from Parakou and Nigeria. Cropping systems observed are monocropping, crop rotation and intercropping practiced respectively by 48.57, 44.29 and 7.14 % of the farmers questioned. Crop rotation is most observed at Nikki (70.27), urban area, while monocropping is most observed rural areas that are Fombawi (73.34) and Sakabansi (83.33). Farmers don't practice intercropping at Sakabansi. The main reason of that is competition among crops leading to low yield. Reasons underlying crop rotation and intercropping are shown in Table 3. In the same way, in similar study in periphery of Dakar, Niang (1999) emphasized that crop rotation and intercropping are not taken into account when crops are settled in; crop sequence is dictated by commercial interest, habit or regional specialization of production.

Land is an important factor to agricultural development. Farmers were categorized in three groups on the basis of their farmland size. Different categories are shown in Table 2. It comes from it that, except Fombawi where production has been temporarily stopped because of livestock da-

mage, more than 70 % of farmers interviewed have less than 500 square meters while 20 % of them have between 500 – 1000 square meters and only about 7 % of them have more than 1000 square meters of farmland size. The implication of these findings is that the farmers are resources poor and that vegetable production around agro-pastoral dams is at subsistence level. This may be associated with lack of capital since farmers moreover used primitive tools (Sabo and Zira, 2009). Nwalieji and Ayayi (2009) reported similar findings and concluded that relatively small vegetable farm size could constitute a major constraint to increased vegetable production in the area.

Majority of farmers interviewed obtained water for irrigation from dug wells as compared to the other source of water which is dam. Therefore, each farmer dug a well of a depth of 2 -5

**Table 2.** Agronomic and irrigation practices adopted by farmers around agro-pastoral dams

Parameters	Location			Total (n=70)
	Nikki (n=37) <sup>2</sup>	Fombawi (n=15)	Sakabansi (n=18)	
	------(%)-----			
<b>Crops grown</b>				
Amaranth ( <i>Amaranthus cruentus</i> )	83.78	80.0	94.44	91.43
Sesame ( <i>Sesamum indicum</i> )	43.24	100	100	70.0
Okra ( <i>Abelmoschus esculentus</i> )	48.65	86.66	66.66	61.43
Pepper ( <i>Capsicum frutescens</i> )	62.16	20.0	11.11	40.0
Jute ( <i>Corchorus olitorus</i> )	27.03	33.33	44.44	32.86
Lettuce ( <i>Lactuca sativa</i> )	32.43	20.0	33.33	30.0
Tomato ( <i>Lycopersicon esculentum</i> )	32.43	46.66	5.55	28.57
Roselle ( <i>Hibiscus sabdariffa</i> )	40.54	13.33	5.55	25.71
Cabbage ( <i>Brassica oleracea</i> )	32.43	-	5.55	18.57
African eggplant ( <i>Solanum macrocarpon</i> )	32.43	-	-	7.14
<b>Sources of seed</b>				
Imported	43.24	0.00	0.00	22.86
Field produce	29.73	100	77.78	57.14
Local	27.03	0.00	22.22	20.0
<b>Cropping system</b>				
Monocropping	21.62	73.34	83.33	48.57
Crop rotation	70.27	13.33	16.67	44.29
Intercropping	8.11	13.33	-	7.14
<b>Farm size (m<sup>2</sup>)</b>				
< 500	67.17	-	94.44	72.73
500 - 1000	27.02	-	5.56	20.0
> 1000	10.81	-	0.00	7.27
Average farm size (m <sup>2</sup> )	534.54	-	184.56	324.19

<b>Water's source for irrigation</b>				
Dug well	100	0.00	16.67	57.14
Directly in dams	0.00	100	83.33	42.86
<b>Irrigation technologies</b>				
Bucket/basin + calabash/pierced can	86.49	40.0	83.33	75.71
Watering can	13.51	60.0	16.67	24.29
<b>Soil fertility management</b>				
Organic fertilizer (cattle manure)	37.84	100	88.89	64.29
Mineral fertilizer (NPKSB and urea)	24.32	0.00	5.56	14.29
Mixture <sup>1</sup>	37.84	0.00	5.56	21.42
<b>Pest and disease management</b>				
Chemical insecticides	37.84	0.00	0.00	20.0
<i>Azadirachta indica</i> leaf extracts	56.76	13.33	5.56	34.28
Wood ash spreading	0.00	0.00	77.78	20.0
Prophylactic practices	5.40	86.67	16.67	25.72

1 using of both organic and mineral fertilizer, 2 Number of respondents, - Indicates no response

meters with 1 – 3 meters wide in Nikki and Sakabansi; while farmers of Fombawi source water directly from dam. At the pick of dry season, wells often dry up leading to crop failure and low yield. Niang (1999) reported such wells, which were used by vegetable producers on the periphery of Dakar for irrigation water supplying. Two kinds of irrigation practice are observed. Bucket or basin associated with calabash or pierced can is more used for irrigation than watering can (Table 2). Majority of the farmers do not quantify the amount of water to be applied to their farms, but use their own intuition to determine when the water supply was adequate. Those practices are reported by Sabo and Zira (2009) in Northeastern Nigeria.

**Table 3.** Reasons underlying crop rotation and intercropping.

Practices	Reasons
Crop rotation	Soil fertility management
	Demand of vegetable
	Pest and disease management
	Land occupation before flood
	Availability of seed
Intercropping	Using of the resources of its best advantage (soil, input, water)
	Humidity conservation
	Lack of farm land

Soil fertility was managed either by organic or by chemical fertilizer (Table 2). Organic fertilizers include cattle manure, household waste and in a small extend poultry manure. Inorganic fertilizer is mainly NPK-SB (14-23-14-5-1) and urea (46 %) intended to cotton crop. This is due to unavailability of specific fertilizer to vegetable production. Pests and diseases especially leaf eating insects are controlled by the application of pesticides and natural plant products (Table 2). Insecticides used are unfortunately those recommended for cotton crop. This situation poses one time again the problem of vegetables quality mentioned by Assogba-Komlan et al, (2007).

### **Constraints faced by vegetable farmers around dams and Opportunities**

The study revealed several constraints militating against vegetable production around agro-pastorals dams of Nikki, Fombawi and Sakabansi. The importance of these constraints varies from one location to another. These constraints are presented in Table 4. From this Table, the difficulties to access to water as soon as dry season take place is ranked as the most important problem at Nikki, while livestock disturbance was the most important problem to vegetable production development at Fombawi and Sakabansi. Indeed, livestock of local farmers (and of some local herders) is mainly conducted by children and teenagers who mostly abandon the animals and spend their time playing. Then animals roam into farms and destroy crops. Pest and disease pressure, difficulties to access to specific input (seeds, pesticides and fertilizers) for vegetable production and credit, low level of equipment, problem of thief follow afterwards. Pest and disease pressure has several impacts on production that are the reduction of number of harvest, the depreciation of vegetable's quality leading then to low yields and low income. Most of the farmers interviewed complained that lack of inputs and capital limits the increase of their area used for vegetable production. This constraint has been reported by Simeni Tchuinte (2005) in urban and peri-urban zones of Djougou (Northwestern Bénin) and was ranked the most important problem to vegetable production in the region.

The Table also showed that land insecurity didn't represent a major constraint to vegetable production around Nikki, Fombawi and Sakabansi agro-pastorals dams, as it is in southern Bénin mentioned by Assogba (2007) and Fanou (2008). However, they have reported constraints of pest



and disease pressure, lack of credit for capital and inputs, problem of water access, the low level of the farmers and in small extend marketing problem. Fanou (2008) added that constraints quoted above were common to whole the vegetable production sector.

The non-availability of credit facilities to improve production, high costs of inputs, livestock disturbance and the problem of thief have been reported by Adebisi-Adelani et al., (2011) in Fadama vegetable farming in southwestern Nigeria. And as far as the unavailability of credit sources is concerned, they pointed out the high interest rates charged by the financial institution and lack of collateral of farmers. In the same way, lack of capital and inputs has been indicated as constraint to the increase of the area of cultivation of vegetable farmers in Mubi region, northwestern Nigeria (Sabo and Adeniji, 2007).

**Table 4.** Ranking order of constraints to vegetable production around agro-pastorals dams. Ranking of constraints based on the relative importance as perceived by vegetable farmers of the different villages. Ranking scale 1-9 (1=highest; 9=lowest).

Constraints	Location		
	Nikki (n=37) <sup>1</sup>	Fombawi (n=15)	Sakabansi (n=18)
Water's access	1	2	-
Pest and disease pressure	2	5	2
Livestock disturbance	3	1	1
Low level of equipment	4	3	3
Problem of thief	5	8	8
Difficulty of access to input	6	-	5
Difficulty of access to credit	7	6	6
Land tenure problem	8	-	-
Low technical skill	9	-	-
Presence of magnans ants on the field	-	4	7
Marketing problems	-	7	4

1 Number of respondents, - indicates no response

Beside constraints facing by farmers, some opportunities appear to them, which are:

- Vegetable production industry is one of the thirteen sector that Government of Bénin is thinking of promoting for the agricultural sector development;
- The availability of suitable area for vegetable production (up and down stream of dams);

- Existence of a strong demand from nearby urban and peri-urban zones (Nikki, Parakou, Kalalé, Pèrèrè, N'Dali and Ségbana) and above all from Nigeria;
- Existence of the extension services in the region that can be useful for vegetable production;
- Possibility of supplying inputs from nearby Nigeria and existence of bio-pesticides specific to vegetable production.

#### Vegetable farmers' perceptions and knowledge of dams silting up

According to vegetable producers, several factors are responsible for the dams' silting-up. The importances of these causes differ from one location to another (Table 5). Nevertheless, the main sources of dams' silting-up are:

- Water erosion and runoff which bring a considerable quantity of sediment (sand, solids) into dams each rainy season. Similar finding has been reported by Maiga et al., (2007) in Burkina Faso. In that study, water reservoir (or waterhole) silting-up was caused by transport of solids and it represents the dominating threat for the surface water reserves. In addition, there is a strong correlation between silting-up and lands' vulnerability to erosion.
- Agro-pastoral dams are water holes and have been settled to provide water mainly for livestock and after that for agricultural development (Capo-Chichi et al., 2009; Kpéra, 2009). For watering, livestock access to dams by all sides militates then in favour of its silting-up. Indeed there are no well-defined roads or ways for livestock for watering; thus, livestock drive contributes to dams silting-up.
- Vegetable production around dams. In fact, in more than 75 % of cases, vegetable production takes place upstream to waterholes; with tillage done by farmers, soils are deteriorated. In this way, transport of sediments by runoff towards dams is made easier.
- Farming fields around dams. It is noted food crops' and cotton's fields around waterholes. They contribute in the same way to dams' silting-up.

**Table 5.** Ranking order of sources of dams' silting-up. Ranking based on the relative importance as perceived by vegetable farmers around dams' of the different villages. Ranking scale 1-4 (1=highest; 4=lowest).

Causes of dams' silting-up	Location		
	Nikki (n=37) <sup>1</sup>	Fombawi (n=15)	Sakabansi (n=18)
Water erosion	1	1	1
Vegetable production around dams	2	-	3
Farming fields around dams	3	3	4
Cattle (livestock) drive	4	2	2

1 Number of respondents, - indicates no response

## Conclusion and Recommendations

Vegetable production around agro-pastorals dams in Nikki municipality play an important role in vegetable supplying of locale people. The socio-economic parameters of producers indicate that the majority of farmers are women; they are mostly part time farmers; various actors are involved in the production. Indigenous leafy vegetables are the most preferred and amaranth, sesame and okra are vegetables the most cultivated. Production is still in subsistence level, since primitive tools are used. Constraints and opportunities to vegetable production around agro-pastorals have been emphasized. Farmers' perception and knowledge about dams' silting-up have also been assessed. Participation of whole dams' users are needed for setting a consensual and sustainable dam's using rules.

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