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Impact of agricultural extension services on spinach (*Amaranthus spp*) production among farmers in Zuru emirate, kebbi state, Nigeria

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Abstract
This study examined the impact of agricultural extension services on spinach (Amaranthus caudatus) Farmers in Zuru Emirate, Kebbi State, Nigeria. Multi-stage sampling procedure involving purposive technique was used to select 110 respondents from 10 communities involved in spinach production in the Emirate Council. Data were collected through questionnaires and analyzed using descriptive statistics. About 47.0% of the respondents' were between the ages of 36-40 years 73.0% were females, 78.0% married and 67.0% were part-time farmers with 5 years mean of farming experience. The majority (77%) of the respondents' had 1ha of land, 58.0% inherited lands. The mean household size was 7 persons with monthly expenditure of N33, 350.00, 61.0% were aware that spinach enhance digestion and emptying of bowel, while 52.0% agreed that spinach reduces symptoms of menopause in women. Their major extension impact felt by spinach farmers were: source of farm inputs in spinach production (x=3.63); credits facilities in spinach production (x=3.62). The level of effectiveness of extension services provided to farmers were very low. They include: proper management of pests/diseases; health benefits and use of spinach (x=0.41) each. The perceived sufficiency of extension services provided was inadequate due to inadequate extension staff with supply of farm inputs being the highest (x=1.21). The major constraints were shortage in supply of spinach to match demand, increasing price of spinach, and low consumer acceptability of spinach products. The study recommended that adequate extension agents should be provided by Government and the available once should step up increased level of extension services to meet the farmers' extension needs in spinach production in the emirate.

Keywords: impact, agricultural extension services, spinach production, farmers, zuru emirate.

Introduction

Spinach is a widely distributed annual vegetable of two major cultivars, *Amaranthus spp* which has green stem and *Basella rubia* with purplish stem belong to the Basellaceae family. It is called vine or Ceylon spinach in English, Malabar spinach in India and Mgbolodi oyibo in Igbo. It is grown widely in tropical zones such as Asia, Africa. Spinach can be grown in a variety of fertile organic matter soil, and it's a green leafy type widely grown in Nigeria (Holmer, 1998; and Douglas, 2001) [8, 3], and takes an important place in the population diet because of its affordability and the nutrients it provides (Holmer, 1998) [8]. It has a long history of use as both medicinal and an edible plant (Nebel and Heinrich, 2009) [13]. Spinach like every other vegetable play the role of maintaining the body cells; organs and also resistance to diseases by helping in the build-up and repair of the human body. Spinach is known to contribute vitamins minerals and fibers to diet and, is a good source of vitamin C which prevents and cures scurvy (Hanif, *et al* 2006) [7]. It contains phyto-nutrients, with large amount of vitamin (A, C, B-complex such as folate), mineral (Potassium, manganese, calcium, and it is low in calories and fats (Goebel, *et al*, 2010) [6].

The purplish specie *Basella Rubia* is rich in carotenoid pigment anti-oxidants such as B-carotene, luten, zea-xanthin. They therefore protect the body against ageing, malnutrition and processes of various diseases (Olujide and Oladele, (2007) [15]; Umesh, (2009) [21]. Regular consumption of spinach *(basella)* Prevents osteoporosis, iron-deficiency anemia (Umesh, 2009) [21]. It contains magnesium which is important in bone formation, energy transfer in cells, nerve and muscle function. There is calcium immunity for body growth, carbohydrate metabolism, DNA and protein formation.

Medicinally spinach has been traditionally used as an anti-inflammatory, anti-convulsive, antifungal, analgesic agent; to lower high blood pressure, cure irregular monthly periods, treatment of anemia, treat boils and to treat dysentery (Roshan, *et al* 2012) [20]. They further revealed that the mucilaginous liquid from the leaves and stalks is used as remedy to headaches.

Growing spinach as well as other vegetables is particularly suitable for small-farmers and their families, because it requires moderate difficulty and limited expenditure for production (Robert, 2003). Farmers earn their living through, using limited farm inputs in its production (Orefi and Demenogo, 2011) [17]. Spinach and other vegetables are the most constantly and extensively cultivated food and income generating crops in many parts of Africa (Orefi and Demenongo, 2011) [17]. Spinach can give high yield per unit area of land; hence generate high income for the farmers (Mohammed, 2002) [11]. Poor dissemination of technological information has resulted in low farm income, weak financial position, and to poor funding of small-holder farmer's economic activities. The level of commercial spinach production is perceived to be low, and observed to be scarce and expensive

in the local Nigerian markets where they are available.

Farmers used of resources and information technologies efficiently is of importance in Nigeria agricultural production (Rahji and Omotesho, 2006) [19]. This will reduce the level of starvation, increase food production and cushion the effect of food insecurity. Increasing quantity of spinach production, means increase in amount consumed and invariably reducing the amount of starchy food consumed. According to Roshan, *et al*, (2012) [20], Spinach contains fiber which provides roughage in diets thereby reducing the intake of starchy foods, to prevention of constipation and diabetes mellitus. It is against this backdrop that the study ascertained the impact of agricultural extension services on spinach production among farmers in Zuru Emirate, Kebbi State, Nigeria. Specifically, the study:

1. Examined the socio-economic characteristics of spinach Farmers;
2. Ascertained the level of awareness of the role of spinach production among farmers;
3. Ascertained the sources of information on spinach production among farmers;
4. Identified the impact of agricultural extension services on spinach producers.
5. Assessed the level of effectiveness of extension services provided to spinach producers;
6. Determined the perceived sufficiency of extension services provided to spinach farmers
7. Identified the constraints militating against spinach production in the Emirate.

Methodology

This research was carried out in Southern Kebbi State (Zuru Emirate), Nigeria. Zuru Emirate is one of the four Emirates in Kebbi state. The Emirate comprises of four Local Government Areas (LGAs) namely; Danko-Wasagu, Fakai, Sakaba and Zuru. The Emirate is located within latitudes 11º and 12º N and longitudes 4º and 5º E of the equator (NPC. 2006) [12]. The state was carved out of the former Sokoto State in 1991; the Emirate is located in the extreme South-eastern part of the state and covers an area of approximately 9,000 square kilometers. It is located on a hilly terrain and is bounded to the north by Gummi Local Government Area of Zamfara State, North-west by Koko Local Government Area, South-west by Yauri Local Government Area, North-east by Bukkuyum Local Government Area of Zamfara State and south by Rijau Local Government Area of Niger state (Girma, 2008).

The estimated population of the Emirate is 582, 106 people (NPC, 2006) [12]. The various indigenous cultural and ethnic groups of the Emirate are the Dakkarkari, Fakkawa, Dukkawa, Kelawa, Kambarawa, Katsinawan laka and Achifawa. Other nonindigenous ethnic groups in the area are the Hausa, Fulani, Yoruba, Igbo and other tribes found in Nigeria. The different religions found in the area are Islam, Christianity and traditionalist, like any other African society, these came as a result of the interaction with the outside world (NPC., 2006) [12]. However, the traditional worship of different deities is still upheld in the area with many festivals celebrated at various times of the year. The weather is marked by a single rainy season and long dry season, the average rainfall of the area is between 1025mm and 1050mm/annum. Mean temperature range between 31^{oC} and 38^{oC}, the rainy season is between April to October. The climatic condition of the area is characterized by hot and wet seasons as in the tropics; the months of November to February are the hamattan period. The soil type is sandy loam and rich, which makes it suitable for agriculture (NPC. 2006) [12]. It is important to point out that production of agricultural goods in pre–colonial Zuru society was geared mainly towards the production of use–values. This is not to say that exchange did not take place. There was exchange between the produce peasant families and commodities of non-peasant households who specialized in the production of agricultural implements and other necessities which were fundamental in the working of family units. Animal husbandry was practiced side by side with crop production, even though on limited scale. The people of Zuru Emirate depend largely on the pastoral Fulani for meat, milk and butter. Hunting was the second important economic activity after crop production. Hunting was regarded as a supplementary occupation and was carried on throughout the year because it provides a means of getting meat for consumption. It also serves as a source of obtaining skins of animals for shoes, warfare robes and for making local drums. Other important economic activities are local handicrafts like pot-making and weaving by women and blacksmithing by men (NPC, 2006) [12].

Results and Discussion

Socio-economic Characteristics of Spinach Farmers

Table 1 shows that greater proportion (73.0%) of the respondents were male. This finding may not be unconnected with seemly less labour stress in vegetable production since it is a very cheap and very good source of income to farmers both during rainy and dry seasons. The findings of Owombo, et al (2012),contradicts the findings of this research by saying female (64.0%) are more involved in spinach farming as compared to the (36.0%) male counterparts. About 47% of the respondents were within the age bracket of 36-40 years. The mean age was 39.8 years. This indicates that the farmers are in their active age and could meet their daily energy requirement in carrying out their farm activities. The majority (78.0%) of the respondents were married. This implies that majority of the respondents are faced with the responsibility of taking care of their families and that such families can help in providing cheap labour.

Table 1: percentage distribution of rural households by socio-economic characteristics

Characteristics	Percentage (%)	Mean (X)
Sex		
Male	27.0	
Female	73.0	
Age		
26 – 30	3.0	39.8 years
31 – 35	23.0	
36 – 40	47.0	

41 and above	27.0	
Marital status		
Single	2.0	
Married	78.0	
Divorced	5.0	
Widowed	7.0	
Nigerian		
Yes	97.0	
No	3.0	
Primary occupation		
Full-time farming	8.0	
Part-time farming	67.0	
Teaching	8.0	
Trading	17.0	
Farming experience		
0-5	51.0	
6-10	45.0	
11-15	4.0	
Farm size (ha)		
1	77.0	
2	18.0	
3	5.0	
Land ownership		
Inherited	58.0	
Leased/Rent	39.0	33.33
Purchased	3.0	
Household Size		
1-5	20.0	7 persons
6-10	75.0	
10-15	5.0	
Monthly expenditure (N)		33,350.00
20.000 – 30,000	30.0	
31,000 – 40,000	60.0	
41,000 – 50,000	10.0	

***Source*:** Field Survey, 2018

Table 1 showed that the majority (51.0%) of the respondents had farming experience of 0-5 years in spinach production, 45.0% of them had farming experience of 6-10 years, while 4.0% of them had farming experience of 11-15 years in spinach production. The mean years of farming experience was 5 years. Results also showed that the greater proportion (77.0%) of the respondents had farm size of 1ha, 18.0% of them had farm size of 2ha, while 5.0% of them had farm size of 3ha. This implies that spinach can thrive even in a small land area just like other vegetables. This could infer that most of the spinach producers are small scale farmers and practice subsistence farming. The majority (58.0%) of the respondents' farm on inherited farmlands, 39.0% of them had leased/rented farmlands, while 3.0% of the farmers' had purchased farmlands. The findings imply that most rural households had inherited land for farming. This implies that most of these rural farmers are indigenes of Zuru Emirate of Kebbi State. Entries in table 1 further showed that the majority (75.0%) of farmers' had household size of 6-10 persons, about 20.0% of them had household size of 1-5 persons, while 5.0% of farmers had household size of 10-15% persons. The household size of 1-57 persons. This implies that the households can conveniently manage the farm labour without employing extra outside labour in farm management. In support, Emodi (2010), observed that large rural households have clear advantage in distribution and tackling of tasks in agricultural production. The result in table 1 also showed that the majority (60%) of the respondents' monthly expenditure was between N31,000 – N40,000 many of them spend between N20,000 – N30,000 monthly, while 10% of them spend between N41,00 – N50,000 monthly. The mean monthly expenditure of respondents was N33, 350.00. This implies that spinach is a lucrative business in Zuru Emirate.

Awareness of the importance of Spinach Production

The entries in table 2 revealed that 61.0% of the respondents were aware that spinach enhances digestion and emptying of bowel, 52.0% agreed that spinach reduces symptoms of menopause in women, 42.0% of them admitted that spinach is cheap sources of treating malnutrition, 37.0% of them said that spinach reduces the risk of asthma, 32.0% agreed that spinach reduces ageing and increase blood supply; while 29.0% respondents claimed spinach to help prevent sicknesses like cancer and heart diseases. This confirms why among the respondents in the study area spinach is named 'hospital two'. This implies that regular consumption of spinach reduces illnesses and visits to doctors.

Table 2: Percentage Distribution of Level of Awareness of Spinach production among farmers

Items	Percentage (100%)
Enhance digestion and emptying of bowel	61.0
Reduces symptoms of menopause in women	52.0
Cheap source of treating malnutrition	42.0
Reduces the risk of asthma	37.0
Reduces ageing and increase blood supply	32.0
Help prevent sicknesses, cancer/heat diseases	29.0

*Multiple response. Source: Field Survey, 2018.

Sources of information on spinach production

Table 2 shows various sources of information on spinach production. 73.0% respondents indicated that information on spinach is from friends and relatives, 30.0% of them agreed that is from health workers in the hospitals, clinics and maternity houses, 20.0% of them from mass media (radio, television and printed media), 15.0% of them said that sources of information was from exhibitions/training programmes/workshops, while 12.0% of the respondents gather spinach information from restaurants/hotels and eating centres. This could imply that extension agents were not effective in promoting the importance of spinach production to the health and food security of the rural households due to their inadequacy. The findings also suggested that health workers provided more information on spinach food security than eating centres.

Table 3: Percentage Distribution of Sources of Information on Spinach Production among Farmers

Items	Percentage (100%)
Friends and relatives	73.0
Health workers in the hospitals, clinics and maternity houses	30.0
Mass media (Radio, Television and printed media)	20.0
Exhibitions/Training programmes/workshops by extension	15.0
Restaurants/Hotels and eating centers	12.0

*Multiple response. Source: Field Survey, 2018.

Impact of agricultural extension services on spinach production among farmers

Table 4 showed that the 10 items investigated were perceived by farmers as extension needs in spinach production. These include: source of farm inputs in spinach production (x=3.63). This is in support of Olakunle (2013) [14], that the distribution and supply of farm agricultural inputs (fertilizers and farming materials) to rural farmers from the government will increase spinach production. The findings also showed that credit facilities in spinach production (x=3.62), effective spinach marketing and training on proper application of fertilizer in the farm were (x=3.60) respectively, supply of quality seeds (x=3.59), use of herbicides in the farms (x=3.58), health benefits and use of spinach (x=3.55), effective storage of spinach (x=3.52). These imply that the respondents need assistance in all the items as it concerns extension services delivery. The findings revealed that the farmers perceived source of farm inputs in spinach production as the most important assistance needed. It seems safe to conclude that without inputs; spinach production cannot be in existence.

Table 4: Mean Distribution of Extension Services to Farmers on Spinach Production

Items	Mean (x)	Standard Deviation (SD)
Information on soil fertility	3.53	0.50
Training on pests and disease control	3.52	0.54
Effectiveness of spinach storage	3.54	0.54
Health benefits and use of spinach	3.55	0.52
Credit facilities on spinach production	3.62	0.49
Supply of quality seeds	3.59	0.52
Effective spinach marketing	3.60	0.54
Use of herbicides in the farms	3.58	0.52
Training on proper application of fertilizer on the farm	3.60	0.54
Source of farm inputs in spinach production	3.63	0.52

***Source*:** Field Survey, 2018.
Key: X = $\geq$ 2.50 shows significance

Effectiveness of extension services provision to spinach producers

The mean scores in table 5 indicated that all the 8 items were considered by the respondents' to be very low. They include health benefits and use of spinach (x=0.41), proper management of pests/diseases (X=x=0.41), training on how best to store spinach (X=0.39), proper use of herbicides on spinach farms (X=0.38), source of quality spinach seeds (X=0.36), proper use and application of fertilizer (X=0.38), source for effectively marketing spinach (X=0.34) and provision of credit facility for spinach production (x=0.30). The results showed that the respondents considered both health benefits and use of spinach, and proper management of pests/diseases as the most effective extension service provided in the study area. The findings

confirmed the need for improved extension services provision to farmers on spinach production (Table 4).

Table 5: Mean Distribution of Effectiveness of Extension Services Provided to Spinach Farmers

S/N	Items	Mean (X)	Standard Deviation (sd)
1	Provision of credits for spinach production	0.30	0.50
2	Source for effectively marketing spinach	0.34	0.55
3	Proper use and application of fertilizer on farms	0.35	.055
4	Training on how best to store spinach	0.39	0.59
5	Source of quality spinach seeds for improved production	0.36	0.53
6	Proper management of pests/disease	0.41	0.58
7	Proper use of herbicides on spinach farms	0.38	0.54
8	Health benefits and use of spinach	0.41	0.55

***Source*:** Field Survey, 2018. Key X=3.00 shows significance

Perceived sufficiency of extension services provided to spinach farmers'

Table 6 shows that all the 10 extension services provided to rural households were perceived to be inadequate by the respondents'. These include: guide on fertilizer application (x=1.33), best place in marketing spinach (X=1.31), source of credit facilities in spinach production (X=1.30), guide on constraints to spinach production (X=1.31), health benefits and use of spinach (X=1.30), information on natural pests and diseases control (X=1.29), source of quality spinach seeds for improved production (X=1.29), regularity of extension agents visit (X=1.28), information on spinach storage (X=1.27) and supply of inputs by extension agents (X=1.21). The results showed that spinach farmers perceived the supply of inputs by extension agents as the most inadequate service provided. This confirms the findings in Table 5, that the level of effectiveness of extension services provided for spinach producers is low. In support, the result in Table 4 confirms that farmers had inadequate farm inputs in spinach production.

Table 6: Mean Distribution of Perceived Sufficiency of Extension Services Provided to Farmers

Items	Mean (X)	Standard Deviation (SD)
Supply of inputs by extension agents	1.21	0.41
Information on spinach storage	1.27	0.46
Regularity of extension agents visit	1.28	0.44
Source of quality spinach seeds for improved production	1.29	0.44
Information on natural pests and diseases control	1.29	0.44
Health benefits and use of spinach	1.30	0.44
Guide on constraints to spinach production	1.30	043
Source of credit facilities in spinach production	1.30	0.43
Best place for marketing spinach	1.31	0.42
Guide on fertilizer application	1.33	0.43

Source: Field Survey, 2018. Key X = $\geq$ 2.50 shows significance

Constraints to Spinach Production among Farmers'

Table 7 reveals that the majority (67.0%) of the respondents indicated shortage of spinach supply to match demand, 53.0% of them confirmed increased price of spinach, 50.0% of them said spinach had low consumer acceptability, 45.0% of them said that spinach cannot be consumed under fresh conditions, 41.0% of them indicated that spinach is completely new in the dietary culture of the people, 40.0% of them confirmed spinach as tedious in processing at household level, 39.0% of them indicated that there is lack of technology for processing spinach at households' level, while 33.0% of the respondents' agreed that spinach has low shelf life of processed products.

Table 7: Percentage Distribution of Constraints in Spinach Production among Farmers'

Items	Percentage (%)
Shortage of spinach supply to match demand	67.0
Lack of technology for processing spinach at households level	39.0
Cannot be consumed under fresh conditions	45.0
Low consumer acceptability of spinach products	50.0
Completely new in the dietary culture of the people	41.0
Increasing price of spinach	53.0
High prices of spinach	40.0
Low shelf life of processed spinach products	33.0
Total	

*Multiple response. Source: Field survey, 2018.

Conclusion and Recommendation

Sufficiency of extension services as perceived by farmers were not adequate. However, if the level of effectiveness of extension services provided for spinach producers is greatly increased, through dissemination of information by extension agents, and community based efforts, the spinach farmers' agricultural extension needs will be met and the perceived sufficiency will be very adequate. There will be increase in the rate of awareness and quantity of spinach produced to meet consumes' demand.

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