

Crop diversity, extension services and marketing outlets of vegetables in Botswana

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ABSTRACT

The strategy of encouraging agricultural production through incentives in Botswana has contributed to an increase in vegetable production and improved farmers' livelihood. However, studies on agricultural extension service issues and marketing problems that farmers experienced over the last years are either rare or absent. This article presents results of surveys conducted in different parts of Botswana to assess the diversity of vegetables produced, evaluate the impact of agricultural extension services provided and the marketing outlets of vegetables in the country. For this purpose a structured questionnaire was used to interview 48 farmers in different parts of the country. Results of the surveys indicated the presence of a high level of crop diversity (17 vegetable crop species) which is planted by rotation in time and space on small fields as mono-crops. Mixed cropping was very rare. Leafy vegetables were the dominant crops in all the surveyed areas. Results indicate that agricultural extension service in vegetable farming system is exclusively provided by governmental organizations and are limited to providing technical advices in vegetable production. Advisory services in marketing and financial management are absent. Vegetable farmers in Gantsi, Southern, Kgalagdi and Northern districts received better advisory service than those in Kweneng and Kgatleng districts. Most of the interviewed farmers travel long distances to get production inputs (85%) and others even import from South Africa (30%). The need of policies encouraging the use of inorganic fertilizers, high-yielding varieties, reduction of reliance on pesticides, provision of inputs and improving extension services and market outlets for vegetables are discussed.

Key words: Botswana, Extension service, Market outlet, Vegetable

INTRODUCTION

The current strategy of encouraging agricultural production through incentives in Botswana (Rebaagetse 1999) has contributed to an increase in vegetable production and improved farmers' livelihood. However, agricultural extension service issues and marketing problems experienced over the last years require further changes for further improvement in the vegetable production system. An important component in achieving this is to obtain an insight into farmers' needs, as acceptance of any innovation must meet the needs of the customer (Mumford and Norton, 1993). In Botswana, the prospect of enhancing the farmers' role as an independent decision-maker requires a realistic assessment of farmers' problems in vegetable production practices and an understanding of the major constraints which may inhibit efforts to acquire inputs and sale outputs. Information needs to be obtained to appreciate

vegetable farmers' practices and to assess opportunities as well as constraints for decision-making at on and off-farm levels, so that appropriate decision tools and tactics can be designed to meet the farmers' needs. This study, involving an interview survey, aims to determine the key constraints in marketing of vegetables and the level and types of agricultural extension services that vegetable farmers in Botswana receive and to provide appropriate suggestions for rational and feasible actions.

MATERIAL AND METHODS

A fully structured questionnaire aimed at assessing the production constraints, farm and crop management practices of peri-urban vegetable farmers in Botswana was designed in June 2009. After a pre survey test on farmers in and around Gaborone, the questionnaire was refined with the addition of few questions from surveys conducted in Ethiopia, Assefa *et al.* (2008) and in Botswana, Seleka *et al.* (2002). The final version of the questionnaire was to interview 48 vegetable farmers, randomly selected from different peri-urban areas of Botswana. Interviews conducted were carried out in English and/or Setswana for respondent who could not speak either of the languages.

Farm owners were interviewed on their farms. In the absence of the owner, the interview was carried out with the farm managers provided they had long experience and detailed knowledge on the farm management practices of the target vegetable farm. The responses to questions on age, educational background, experience in vegetable production, access to agricultural extension services and marketing outlets were recorded. For each question, the percentage of farmers who gave similar responses was calculated for each district and percentages calculated based on the total number of farmers who responded to each question. Those who did not respond to certain questions were excluded in the analysis. In instances where a farmer selected more than one reason, percentages were calculated for each group of similar responses. Data from the questionnaire were encoded, entered in Microsoft Excel 2003 spreadsheet and checked prior to analysis. Frequencies and percentage variable occurrences were calculated using cross tabulation (PROC FREQ), in SAS (SAS Institute, 2003).

RESULT

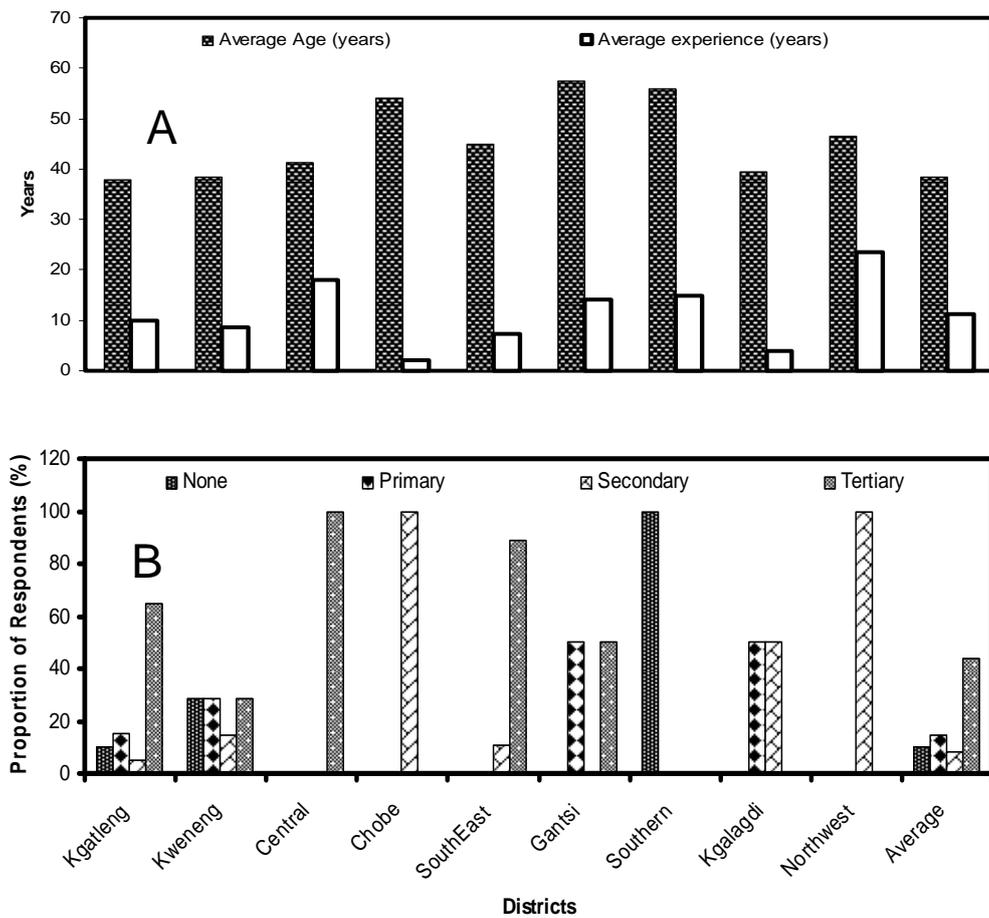
Farmers' biographic data and vegetable production practices *Biographic data*

Figure 1 Shows the age, farming experience and educational background of interviewed farmers. The average age of the respondents ranged from 37.9 years (Kgatleng District) to 57.5 years (Gantsi District). The overall average age of the interviewed farmers is 38.3 years (Figure 1a). Vegetable farming in the study areas was performed by highly educated and relatively less experienced young farmers. The average number of years an individual farmer involved in vegetable production was 11.3 years (Figure 1a). There was a significant variation in educational background of farmers between districts. The highest number of illiterate farmers was recorded in southern District. whereas Kgatleng, Central and South East Districts had the highest proportion of farmers who attended tertiary education (Figure 1b).

Diversity of vegetables produced in the study area

Table 1 shows the main vegetable crops grown by farmers in the nine districts included in this study. Farmers listed a total of 17 vegetables. Most of the respondents grow between five and 10 different vegetable species. There observed a slight

variation on the types of vegetable crops between Districts. However, leafy vegetables are dominant in all the districts. The most commonly grown vegetable in the study areas was rape accounting for about 70.8% of the respondents closely followed by Swiss chard (64.6%), tomato (54.2%) and cabbage (50%) (Table1). Other vegetable crops produced by the interviewed farmers were eggplant, Chinese cabbage, chilli, cucumber, Ethiopian mustard and watermelons. In all the districts visited vegetable crops were planted by rotation in time and space on small fields as mono-crops. Mono-cropping in this view does not refer to planting a single species of vegetable in an extensive area, but cultivation of small blocks varying in size of different crops adjacent to one another in the same strip plot. Only one farmer in North West district practiced mixed cropping (planting of different species of vegetables mixed in a plot) with an objective of minimizing insect pest damage and increasing yield.



Figs. 1: Age and experience (A) and Educational background (B) of interviewed peri-urban vegetable farmers in the study areas

Table 1 Vegetable crops grown by farmers in the study areas

	Kgatlang	Kweneng	Central	Chobe	SouthEast	Gantsi	Southern	Kgalagadi	Northwest	Average
Tomato	40	28.6	100	100	66.7	100	100	50	100	56.3
Cabbage	30	42.9	100	100	77.8	50	0	0	100	50
Onion	35	0	75	100	22.2	50	0	100	100	37.5
Green pepper	25	0	75	0	33.3	0	100	0	100	29.2
Carrot	5	28.6	50	0	0	50	0	50	50	16.7
Beetroot	25	14.3	75	0	0	50	0	50	50	25
Swiss chard	65	42.9	75	0	77.8	100	100	100	50	66.7
Rape	65	57.1	75	100	100	50	100	50	100	72.9
Choumollier	35	42.9	50	0	0	50	100	50	0	31.3
Butternuts	20	14.3	75	0	66.7	0	0	50	100	35.4
Others	5	14.3	0	0	44.4	100	100	50	100	25

Vegetable production practices and access to production inputs

Majority of the farmers interviewed were producing their own vegetable seedlings (83.3%), apply inorganic fertilizers (85.7%) and pesticides (97.9%) to their vegetables (Table 2). The proportion of farmers raising vegetable seedlings varied from district to district. All the interviewed farmers in Northwest, Kgalagdi, Gantsi and Chobe districts raising their own seedlings and only 57.1% of the respondents in Kweneng district raised their own seedlings. Only few farmers (14.3%) produce vegetables by applying only organic fertilizers. Interviewed farmers used animal waste (cattle, small ruminant and chicken manure) and compost. The type of organic fertilizer used varied from district to district depending on the availability of a product. Organic fertilizers are usually used together with inorganic fertilizers. The use of organic fertilizer and inorganic fertilizers together is common in most of the districts visited. Except one farmer in North West district who practiced organic farming, all the interviewed farmers rely on synthetic pesticides for management of pests (Table 2). Pesticide use is largely limited to insecticides and frequent application of a variety of these was common in all the districts surveyed.

Table 2 Vegetable production input used by farmers in the study areas

	Kgatlang	Kweneng	Central	Chobe	SouthEast	Gantsi	Southern	Kgalagdi	Northwest	Average
Raising own seedlings	90	57.1	75	100	66.7	100	100	100	100	83.3
Fertilizer										
Inorganic	50	28.6	75	100	66.7	0	0	50	50	47.6
Organic	0	28.6	25	0	0	50	100	50	0	14.3
Both	50	42.9	0	0	33.3	50	0	0	50	38.1
Use of Pesticides	100	100	100	100	100	100	100	100	50	97.9

Majority of the interviewed farmers (69%) purchase production inputs like vegetable seeds, fertilizers and pesticides from nearby towns that are not more than 50km away from their farm. However, a significant proportion of the respondents have to travel a distance of more than 200km to access these production inputs (Figure 2). Some farmers even cross borders to purchase vegetable seeds and pesticides. About 30% of the interviewed farmers in this study buy at least part of the input they need for production of vegetables from South Africa.

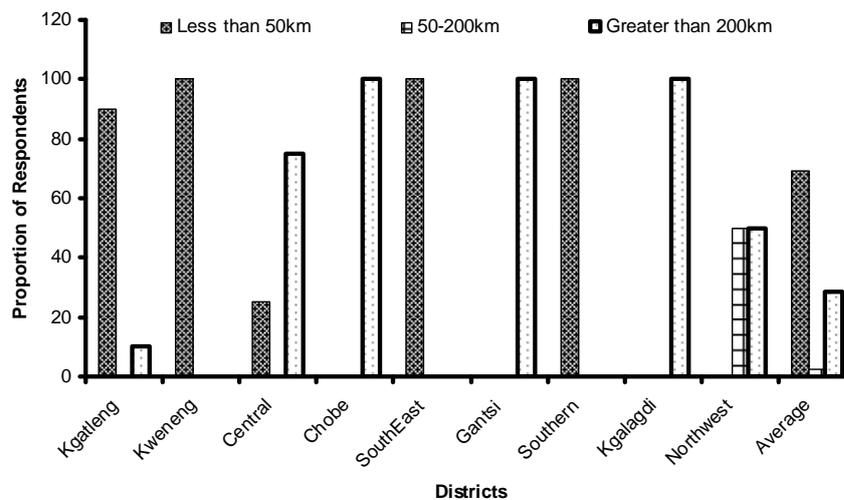


Fig. 2: Distance between the input market and the vegetable farms of the interviewed peri-urban farmers in the study areas

Almost all of the interviewed farmers (96.9%) complained that inputs are expensive (Fig. 3). For 34.4% of the respondents, absence of suppliers in their area is one of the major problems in marketing of production inputs. Nineteen percent of the interviewed farmers had a transport problem to access the input market. A quarter of the respondents believe that number of input suppliers in their area is very few (Fig. 3).

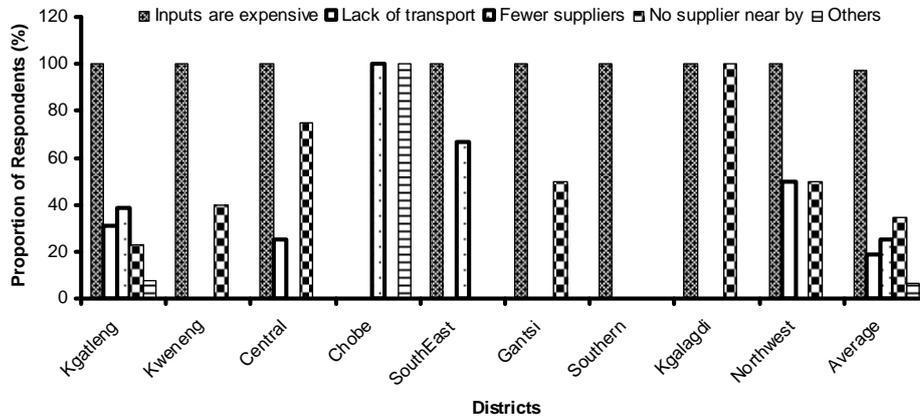


Fig. 3: Input marketing problems encountered by interviewed Peri-urban Vegetable farmers in the study areas

Institutional support

Proportion of respondents who received extension services in the last 12 months and those who are members of farmers association are indicated in figure 1. Majority of the interviewed farmers (51.2%) received no advisory service for a year. Agricultural extension services are better in northern part of the country than the southern districts. Vegetable farmers in Gantsi, Southern, Kgalagdi and North West districts received more extension services than farmers in the rest of the study area (Figure 4). The agricultural extension services in vegetable farming system are mainly focused on vegetable production practices and are offered by horticulturalists, field assistances and/or district agricultural extension experts. Services on farm management and marketing are either absent or scarce. Many of the interviewed farmers (44.7%) are members of farmers associations. These farmers participate in the meetings of their association to share ideas and support each other. Farmers also use their association to lobby the government.

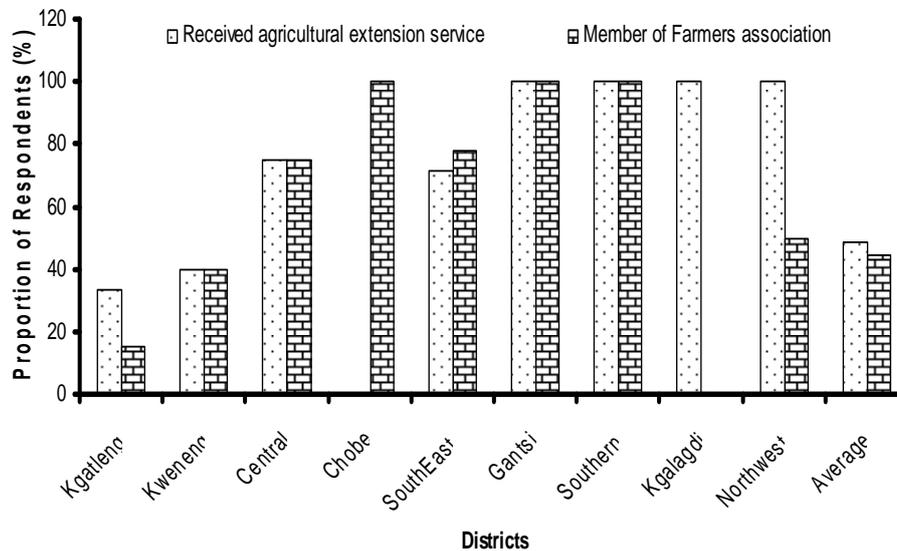


Fig. 4: Institutional support received by the interviewed peri-urban farmers in the study areas

Marketing outlets of vegetable produce

Fig. 5 shows the marketing outlets of vegetable produce from the peri-urban vegetable farms in the study area. Farmers listed a total of five consumer groups to whom they sell their produce. The most common customers of the vegetable produce in all the districts visited were Hawkers (95%) and individuals (97.5%) in the surrounding towns. More than two third of the vegetable farmers interviewed selling their produces to retailers. Only few farmers sale their vegetable produces to Institutions (22.5%) and Wholesalers (30%).

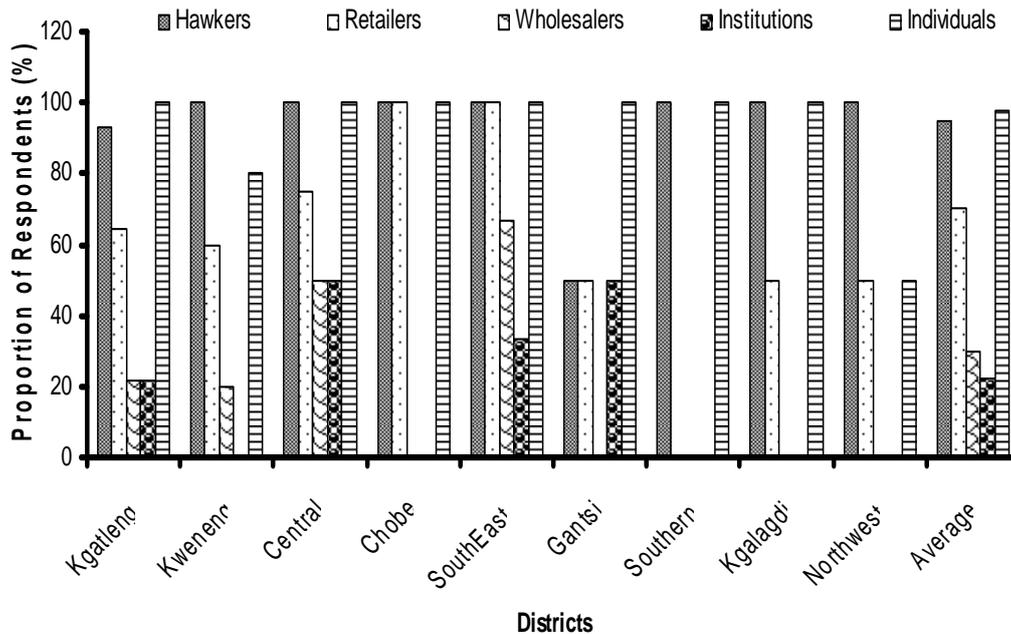


Fig. 5: Product markets of the interviewed peri-urban farmers in the study areas

Most of the interviewed farmers fix the price of their vegetable produce (69.4%); in few cases prices of vegetables were determined through negotiation (22.2%) or buyers dictate the price (13.8%) and in rare cases Ministry of Agriculture fixes the price (2.8%) (Fig. 6a). When farmers fix the price of their vegetable produce, most of them look at the market price of a produce (78.1%) and few of the interviewed farmers consider the production cost (28.9%) (Fig. 6b).

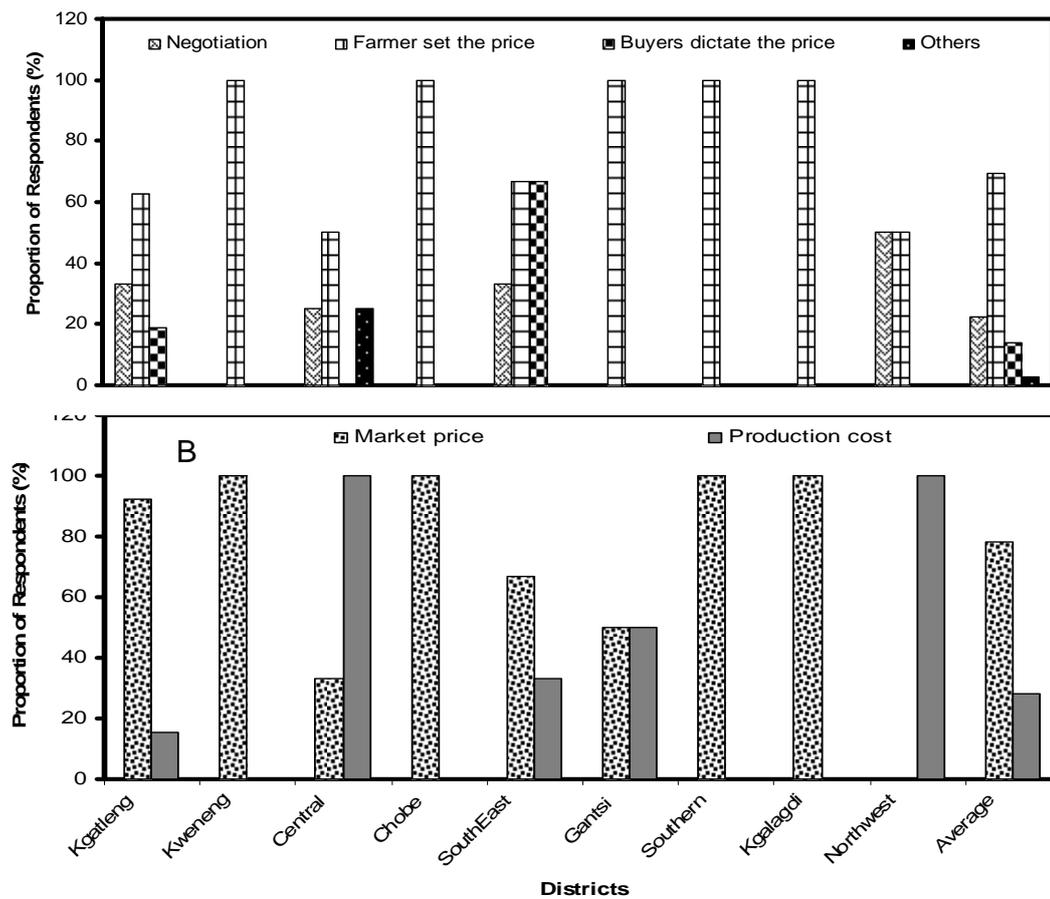


Fig. 6: Vegetable price fixing (A) and Base for fixing price (B) by interviewed peri-urban vegetable farmers in the study areas

Farmers listed a total of 8 constraints to market their outputs. Transport problem was mentioned by more than 39% of the farmers as the major constraint followed by inadequate demand (36.8%) and inability to control price (36.8%) (Table 3). Fierce competition, high quality standards and inconsistent supply were also among the problems mentioned by some of the farmers (Table 3).

Table 3 Farmers’ perception of output market constraints in the study area

	Kgatleng	Kweneng	Central	Chobe	South East	Gantsi	Southern	Kgalagadi	Northwest	Average
Inadequate demand	33.3	100	25	0	22.2	100	0	0	50	36.8
Fierce competition	46.7	66.7	25	0	0	0	0	0	100	13.6
Inability to control prices	53.3	0	25	0	44.4	0	0	0	50	36.8
High quality standards	0	0	25	0	0	0	0	0	50	5.3
Transport Problems	26.6	0	75	100	44.4	50	0	50	50	39.5
Inconsistent supply	13.3	0	50	0	44.4	0	100	50	100	28.9
Others	0	0	25	0	0	0	0	50	0	5.3

DISCUSSION

Farmers’ biographic data and vegetable production practices *Biographic data*

Several farmer specific factors have been reported to have an impact on cost of production and productivity (Lien and Hardaker 2001). Farmer’s age, educational level and experience are among the major factors that affect productivity. Age can often be an indicative of farmer’s knowledge and social network (Trienekens *et al.* 2008). However, increased age may seriously impair farmer’s physical ability for carrying out farming operations (Bembridge 1991). Moreover, old farmers are slow in

adoption of new strategies, especially high-input activities. A high educational level is associated with efficiency, innovativeness and improved skill of negotiation ((Trienekens *et al.* 2008). Similarly more experience means more information sources and knowledge about production and marketing (Trienekens *et al.* 2008). Farmers' experience in vegetable production observed in this study may not be long enough to acquire relevant knowledge on vegetable production and marketing. However, young and educated farmers are more likely to adapt to the system very easily and in a short time. It is, therefore, essential to understand the interactions between system components when planning interventions such as introduction of new crop production and marketing strategies. Generally, results from this study show that the profile of farmers is such that adoption of new strategies, especially high-input activities will be very fast. Development of technologies creates opportunities for a more efficient, competitive and profitable means of production in agricultural sector; and those who adopt these technologies faster are able to control the market than late adopters (Gurel 1998). Therefore, the chance of increasing the productivity and competence of the peri-urban vegetable farmers in the country through introduction and adoption of latest technology is high.

Diversity of vegetables produced in the study area

Diversity in growth period, cost of production and market are among the factors that determine the value placed on the different vegetable crops. Previous study by Obopile *et al.* (2008) indicated the high diversity in the type of vegetable produced by individual farmers in the country. The fact that farmers are still holding and planting different vegetable crops in their farm implies that they recognize the need to maintain this diversity and they have developed strategies and skills for adapting their production to the market demand and their own specific household needs. These skills need to be built upon, and establishing links between market outlets and local crop development may be one way of doing so. Clearly, these skills, when developed or enhanced will be indispensable for improving the livelihood of the farmers. The impact of mixed cropping that is practiced by a farmer in the North West district on productivity and pest management need to be further studied. This practice has been reported to reduce pest infestation (Hiddink *et al.* 2005) and increase in yield (Powers *et al.* 1994).

Vegetable production practices and access to production inputs

The increase in demand for vegetable produce and the fast development of market outlets such as open markets and supermarkets in Botswana provides rich opportunities for small-scale farmers to boost their produce and increase their income. However, market oriented production requires the use of high yielding varieties and increase dependence on chemical fertilizer, pesticide and micro-nutrient addition (Brown and Shrestha 2000) which ultimately increase production cost. The high level of operational costs incurred in small-volume-based vegetable production due to high input cost, unavailability of the inputs in nearby markets and lack of transport further soar the cost of production and hinders farmers from participating in these emerging markets (Machethe, 2004). The findings of this study suggest that encouraging farmers to produce their own vegetable seedlings, incorporation of the use of organic fertilizers and non-chemical pest management methods in the peri-urban vegetable farming system of the country will reduce the production cost and increase farmers' competence in the emerging markets. There is also a need to efficiently reduce transaction costs in input supply chains in order to create a better environment for small-scale farmers in emerging markets of Botswana. Organic fertilizers are reported to increase germination and better yield than that with inorganic fertilizer (Cimino and

Toscano 1993). Excess application of pesticides was common in all the districts under this study. Most of these pesticides are hazardous and the local farmers did not practice safety precautions. The intensive use of pesticides place the farmers at risk to acute and chronic poisonings, may result in unacceptable pesticide residues in the soil and crops and in an expansion of pest resistance (Tomlin 1997). To realize the full economic benefit of pesticide use without its adverse effects, efforts should be directed at creating awareness and encouraging the use of pesticide handling and application safety precautions.

Institutional support

In this study more than half of vegetable farmers interviewed did not receive advisory services from Ministry of agriculture on issues of technology and marketing of vegetable produce. That proportion of those who received the advisory services varied among districts indicating a level of variance in delivery services by extension services. Our results agree with that of (TAHAAL 2000) who reported low delivery of advisory services by extension agents to farmers. The low delivery of extension services will have a negative impact on vegetable production and marketing of produce that will hinder the government effort of increasing agricultural productivity. An effective way of addressing the concern with increasing agricultural output and productivity is to develop and disseminate to farmers technologies and policies that are appropriate to their social and economic circumstances (DAR 2000).

Low adoption of technology by farmers has been recognized as one of the core problems in efforts to increase agricultural productivity (Acquah *et al.* 1998). One major constraint to delivery of extension services by Ministry of Agriculture was attributed to lack of transportation by rural extension agents who have to travel long distances to meet farmers in their production areas. It is therefore imperative to strengthen linkages between farmers, their association and extension departments of the Ministry of agriculture.

Marketing outlets of vegetable produce

Activities to scale up production of vegetables have increased greatly in the recent past. There is a high demand for vegetables in the urban markets and increased consumption in rural areas. However, issues of quality control, reliability and pricing remain critical to the future success of vegetable farming in the country. The fact that vegetables are fast becoming the choice of the society including the upper and middle class households, and generally among the elite in Botswana is a situation that requires serious assessment and action plan. Similarly, higher income prospects in any trade create competition and sooner or later non-competitive segments of the market fall by the way side in due course, and in our case these would be small-scale peri-urban farmers and traders. These issues are fundamental and need focusing as vegetable enter a new phase of production and consumption regimes. More efforts are needed to cushion the vulnerable groups, who have previously dominated the vegetable market, against the emerging big and medium commercial players who are currently in complete control of the wholesale, institution and retailer market. Otherwise, exploitation and loss of livelihoods among the vulnerable groups will be inevitable.

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