

An Assessment of Off-Season Vegetable Farming on Farmers in Savelugu Municipality in the Northern Region

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Abstract: The study aimed to assess the impact of off-season vegetable farming on farmers in the Savelugu Municipality in the Northern Region. The study population consisted of all respondents to off-season vegetable farming in the Savelugu Municipality in the five selected communities in the Northern Region. A purposive sampling technique was used for a sample size of fifty (50) off-season farmers in the selected communities. An interview guide and questionnaire were used to solicit data to conclude the findings. The data derived from the questionnaire were analysed in a step-by-step thematic analysis that included reading the transcriptions several times, coding, generating codes, and reviewing and naming themes. Afterwards, the questionnaire and interview guide responses were transferred into Microsoft Excel under assigned variable names. Descriptive statistics, namely frequency, means, and percentages, were used to analyse the data. Off-season vegetable production technology can be gained by using different agro-climatic regions, maintaining or adjusting planting time, selecting varieties, and creating artificial and controlled environments through tunnels, polytene houses, glass houses, hotbeds, etc. Moreover, Off-Season vegetables helped earn income and ranked highest with an overall mean score of 1. Nearly all the trained farmers said their primary constraint was the high incidence of pests and diseases. It is evident that off-season cultivation is profitable and significantly impacts the farmers' consumption expenditure and food security status. Therefore, providing improved and modern agricultural inputs to off-season farmers is essential for rural agricultural development.

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1. Introduction

Vegetable farming is an extensive input enterprise. In recent years, there has been a growing trend in the practice of off-season vegetable production in the country. Considering the modest profit margins in the off-season, farmers are inclined to produce vegetables in the off-season. This is attributed to the fact that farmers expect vegetables produced in the off-season to fetch a better price than those grown during the regular growing seasons. It has also been observed that crops require excessive pesticide use in the regular growing season. Studies have shown that the use of such chemicals has increased by 70 per cent, and pesticides have resulted in residue accumulation in crops [1, 2]. It has further increased the cost of production and has reduced farmers' revenues. Experience has shown that off-season vegetable production requires less frequent use of pesticides and other chemicals than normal-season vegetable production. Studies have also demonstrated that the use of pesticides is related to farmers' attitudes and behaviour [3, 4]. Off-season farming has a significant impact on farmers and society. It is observed that many farmers need to realise its effects on them and the general culture at large. Off-season vegetable farming refers to producing fresh vegetables outside their typical cropping cycle, i.e. when supply is low and prices are high. The concept of off-season

vegetable growing is new to the farmers, and they need to learn more about off-season farming. This is one of the modern practices that can give farmers higher profits and satisfy the requirement of consumers at any time, anywhere, with more choices.

Regional Advisory Information and Network Systems (RAINS) is a non-governmental organisation (NGO) that realises the importance and impact of off-season farming on farmers and society. They have chosen five (5) village communities, including Koduhizegu, Kuldali, Libga, Kpalung and Dipale, under the jurisdiction of Savelugu Municipality at this initial state. The NGO's criterion in choosing these communities is that those villages are close to rivers and Dams, which serve as a water source for farming. Although one of these villages has already been into this farming for some years now, the benefits of the farmers in that village will serve as an example to back this idea before the people in the other communities are emulated.

It aims to produce and supply the vegetables to the market during their lean period. Keeping the farmers employed all year helps to tackle the problem of unemployment. Farmers can study particular vegetable production techniques, which expands their knowledge and enthusiasm in that field. Also, the NGO realised that farmers during the off-season period avail themselves at various pavilions to have partisan political discussions without engaging in things that benefit them. With this, they sometimes end up in disagreement and other disputes that retrogress them and society in their life endeavours. Again, most farmers usually hunt through bush burning, which may cause some critical animal and plant extinction. Still, with the help of RAINS, these farmers can engage in off-season farming to preserve these wildlife animals.

Vegetables are an integral part of human food. They are an essential source of vitamins, minerals, carbohydrates, and proteins for good human health. During off-season farming, the NGO observed that most farmers in Northern Ghana have little to do to engage themselves in hunting through bush burning, sitting under pavilions, having unnecessary discussions like partisan politics, and unnecessary quarrying, sometimes leading to fights among themselves. Looking at the importance and benefits of off-season farming, the NGO took it upon itself to engage the farmers in off-season farming. It has been empirically established that crop yield varies across field conditions and regions [5]. As farmers become aware of the benefits of off-season crop production vis-à-vis the increasing demand for certain types of vegetables in the market, when the supply of such vegetables declines from other areas, they adopt the cultivation of off-season vegetables. Over the last couple of years, farmers have switched to off-season vegetable production across the country. Like many other parts of the country, in the Savelugu Municipality in the Northern Region, there is an increasing trend of off-season vegetable production in the Savelugu Municipality. Considering the economic significance of off-season vegetable production and its contribution to the farmers' income, this research was designed to assess the impact of off-season vegetable farming on farmers in the Savelugu Municipality in the Northern Region of Ghana. The study aims to determine the effect of off-season vegetable farming on farmers in the Savelugu Municipality in the Northern Region of Ghana. The study sought to answer these research questions: (1) Which production technology do the off-season vegetable farmers use? (2) What are the economic gains of off-season vegetable farming for farmers? (3) What are the constraints of off-season vegetable farming for farmers?

1.1. Vegetables

Vegetables are an integral part of human food. They are an essential source of vitamins, minerals, carbohydrates, and proteins for good human health. Vegetables are the most critical component of our food and supply vitamins, minerals and fibres essential for human health. Some vegetables are considered protective foods to prevent cardiac disease, diabetes, and constipation. However, the present consumption of vegetables in Bangladesh is 126 g day⁻¹ capita⁻¹ (23 g leafy vegetables, 89 g non-leafy vegetables and 14

g fruit), far below the minimum average requirement of 400 g day⁻¹ capita⁻¹ [6]. Vegetable farming, with its higher farm-gate values and productivity, is an essential agribusiness sector [7].

1.1.1. Vegetable Farming

Vegetable farming has become essential to agriculture in the surrounding cities [8]. It has supported the livelihood of farmers through household subsistence farming on the commercial scale [9]. Vegetable farming in the surrounding city areas has increased due to continuous rural-to-urban migration [10]. In an area where agriculture is the livelihood and cash income occupation, vegetable farming is one of the most productive enterprises for cash generation [11]. The area, production, and yield of vegetables are increasing [12]. Vegetable farming has become an essential urban agriculture sector and a regular income source for farmers practising agriculture, even on a small plot of land [13, 14].

1.1.2. Vegetable Production

Vegetable production provides a source of livelihood for about 30% of all crop-producing households in Ghana. It represents approximately 32% of the total crop sales for the producing households (Ghana Statistical Service [GSS] [15]). Furthermore, Ghana's favourable agronomic conditions for vegetable cultivation and its proximity to and bilateral relations with the European Union (EU) position the country at an advantage in benefiting from vegetable exports. However, this advantage has yet to be fully exploited over the years, among other things, due to low productivity. Official statistics put annual EU vegetable imports from Ghana at around \$9 million from 2008 to 2013. However, for the same period, whilst the value of pepper (*Capsicum* sp.) and eggplant (*Solanum melongena*) exports to the EU declined by 10% and 11% annually, respectively, that of all vegetables declined by 10.5%. While most Ghanaian vegetables are not exported (only 2.3% are), statistics also indicate that domestic production was 23% below consumption from 2002 to 2013, and this deficit has grown annually by 22%. Consequently, 4,000 tons of vegetables are imported to make up for the consumption deficit in Ghana [16]. The divergence in production and consumption can be attributed to low yields, as will be shown in this paper, and to increased food demand due to population growth, urbanisation, and changing consumer preferences (Ministry of Food and Agriculture [MOFA] [17]).

1.1.3. Off-season vegetable cultivation

Off-season vegetable cultivation refers to producing fresh vegetables outside their typical cropping cycle, i.e., when supply is low and prices are high. The concept of off-season vegetable growing is new to the growers, who need to learn more about it. This is one of the modern practices which can give farmers higher profits and satisfy the requirement of consumers at any time, anywhere, with more choices. The main objective of off-season vegetable cultivation is to produce and supply the vegetables to the market during their lean period [11].

1.2. Technology of Off-Season Vegetable Farming

Off-season vegetable production is a type of agricultural technology in which vegetables are cultivated and produced fresh before or after their regular season. There may be delays or early production in days, weeks, and months. This Off-Season vegetable production technology can be gained by using different agroclimatic regions, maintaining or adjusting planting time, selecting varieties, and creating artificial and controlled environments through tunnels, polythene houses, glass houses, hotbeds, etc. With its higher farm-gate values and productivity, vegetable farming is an essential sector in agribusiness [7]. It has supported the livelihood of farmers through household subsistence farming on the commercial scale [9].

The main objective of off-season vegetable production is to produce and supply vegetables to consumers at lean supply periods and to provide the best product prices. This technology offers higher prices to farmers. Also, this technology ensures food security during peak periods to promote timely employment. Off-season vegetable farming is the best source of income for others and an effective means for reducing poverty, unemployment and malnutrition, which continually exists. Commercial vegetable farming has played a vital role in contributing to the enhancement of the economic status of the farmer. It provides regular employment and income to the marginal farmers and their family members throughout the year by bringing economic gains [18]. Major crops like tomato, cauliflower, cabbage, onion, green peas, radish, carrot, brinjal, etc., are grown as Off-Season vegetables. Previous studies have shown that adopting improved vegetable technologies can dramatically improve economic well-being [19]. Altitudes from 400m to 2000 meters are suitable for off-season vegetable production.

1.2.1. Types / Techniques of Off-Season vegetable production

1.2.1.1. Adjusting Planting Time

Some vegetables can be grown by altering the time of cultivation. For example, cucurbitaceous crops can be grown two months earlier in warmer regions.

1.2.1.2. Using Different Agro-climatic Regions

Many countries, like Ghana, have a diverse range of climates and geographical variations. By utilising these variations (micro-climates), the same vegetable can be grown as seasonal in one place and off-season in another within the same country.

1.2.1.3. Selection of Varieties

Many hybrid varieties of vegetables are widely used to produce vegetables in the early and late seasons. Using these varieties has created a more extended availability of vegetables and year-round production.

1.2.1.4. Creating a Controlled Environment

The main challenge for off-season vegetable production is temperature, so different structures are used to maintain temperature.

1.2.1.5. Plastic Tunnel

It is the easiest, cheapest method of controlling the environment's small greenhouse-like structure, covering the plants along the row with the help of a polythene sheet. It helps with the early growth of plants by increasing temperature, and it protects them from frost, rain, etc. Seed beds are raised about 1m in width, and also bamboo stakes are bent over them, giving a semicircular shape, and polythene is tied over the structure. Generally, this is practised for raising seedlings during the summer and winter. The low-cost plastic tunnels can be used to protect the crops from excessive rainfall and provide a favourable environment for the production of better quality crops throughout, i.e. research workers also reported earliness in maturity, better quality and higher yield in various cultivars of tomato grown for protected culture [20, 21].

1.2.1.6. Polythene House

Polythene houses can be prepared in various sizes according to our requirements using polythene sheets, bamboo stakes or galvanised iron pipes. Tall plants like cucurbits and tomatoes are mainly grown in this type of structure. Many small and marginal farmers in the hills are involved in the off-season plastic house tomato production [22].

1.2.1.7. Glass House / Green House

A greenhouse is a structure with walls and a roof made of transparent material, such as glass or plastic, in which plants requiring regulated climatic conditions are grown [23]. It is a type of structure specially designed for vegetable production and the protection of off-season plants against cold or heat. A glasshouse is provided with the facility to manage temperature, humidity, soil moisture, light, etc., per the plants' requirements. It is expensive, and the production and yield of this structure are of excellent quality. Greenhouse crop farming has the advantage of offering year-round crop production, crop protection, increased yields, vegetable production in limited land sizes and superior quality products [24, 25].

1.2.1.8. Hot Bed

The hotbed is a pile of organic manure which provides heat due to the metabolism of microorganisms. The principle on which the hot bed works is that fresh manure (cow dung/sheep yard manure and poultry manure) ready for fermentation generates heat, which is utilised to quick the germination by providing suitable conditions for germination and faster growth of the seedlings, which results in early maturity of the crop [26]. It is practised in cool seasons. Besides these structures, cold frames, plastic mulching, hormones, poly pots, thatches, net houses, etc., can also be used.

1.3. Economic Gains of Off-Season Vegetable Farming to Farmers

The economic benefits of off-season vegetable production are as follows:

- Off-season vegetables help farmers get higher prices for their products.
- Consumers can have fresh products throughout the year, even in the off-season.
- If production is qualitative and massive, there is a chance of exporting to foreign countries, which would provide year-round employment opportunities and high earnings.
- Farmers can build their knowledge, learn ideas and specific techniques, and develop confidence so that they can start this technology on a commercial scale.
- It is an excellent preventive food source that contributes to nutritional security.
- Small and marginal farmers will benefit from this type of production. This keeps the farmer employed all year, which helps to tackle the problem of unemployment.
- Farmers can study particular vegetable production techniques, which expands their knowledge and enthusiasm in the field.
- It instils confidence in farmers and makes vegetable farming their primary profession [27].

1.4. Constraints of Off-Season Vegetable Farming

The main constraints to off-season farming are Insect pests and diseases, high investment costs for rain shelters, lack of quality seed, high input costs, low selling prices, flooding, difficulty finding a buyer and vegetable diseases. Many other problems in off-season vegetable planting may limit some farmers from growing off-season vegetables. These are as follows:

- The cost of constructing the plastic houses is higher.
- It requires costly seeds.
- It requires ongoing supervision.
- It requires a higher level of expertise than usual season production.
- It can also be dangerous due to the chance of disease and pest infestation.
- It tends to pollute the environment.
- Continuous support for improved technology needs to be improved.

- In addition, adequate packing materials are not readily available.
- The market information system is not accessible.
- This product is not covered by crop insurance.
- The production area needs to be a more organised market.
- There is also a need for more marketing education and extension services [28].

2. Material and Methods

Considering the research questions and the nature of the impact of off-season vegetable farming on farmers in the Savelugu Municipality in the northern region, explanatory and descriptive research designs will be implored for this research. This study follows a descriptive research design, and data are collected via interviews and open-ended questionnaires and analysed with the help of descriptive coding and thematic analysis. This is because the study intends to measure the respondents' opinions in line with the phenomenon. It examined the relationships between various variables to explain better how one variable influences the other. Selecting an appropriate research type is critical to solving a research problem. It also makes the research findings valid and reliable. Based on this, the study employed qualitative research. Therefore, the research saw this type as appropriate because it helps to gather information about the impact of off-season vegetable farming on farmers in the Savelugu Municipality in the Northern Region.

The study population includes all respondents in off-season vegetable farming in the Savelugu Municipality in the five selected communities in the northern region. A sample is a selected part of a population from which characteristics of the whole are estimated [29]. The sampling techniques used for the research are purposive sampling technique and convenient sample technique. Given the nature of the study and the sort of data needed to realise the purposes of this study, it is essential to source information from respondents and key off-season farmers involved in actual farming business. Thus, the choice to settle on purposive sampling. Purposive sampling is a technique in which researchers purposely choose respondents who think they are related to the research topic. In this regard, the researchers select cases judged to typify the group's view. The study's sample size is fifty (50) respondents of off-season farmers in the selected communities.

The study used an interview guide and a closed-ended questionnaire to solicit data to conclude the findings. A questionnaire and interview guide are an essential tool for data collection and also serve as a guide for respondents for data collection. A questionnaire and interview guide will be used for the study because it allows for a large amount of data to be collected within a short period [30]. Also, it enables respondents to give frank answers to possible questions. The questionnaire will be written in simple language so the respondents feel free to answer. In addition, using a questionnaire is considered vital to the research since it provides accurate information regarding the study subject.

An official letter was sent to the Municipal Agriculture Office to get them to know about the study subject matter and to show its importance to the Municipality. Another letter will be directed to the respondents in the form of informed consent about the pending study and their cooperation in completing it. Also, two additional research assistants were trained to administer the questionnaire to the selected participants. The study used seven days to collect the data for further processing. The data collection embraced the various sources, including the types of data collected and the instruments used to collect the data. The study collected both secondary and primary data and used an open-ended questionnaire, where respondents were allowed to answer the questions. The data derived from the questionnaire are analysed in a step-by-step thematic analysis that includes reading the transcriptions several times, coding, generating codes, reviewing and naming themes [31]. Afterwards, the questionnaire and interview guide

responses will be transferred into Microsoft Excel under assigned variable names. The data will be analysed using descriptive statistics such as frequency, means, and percentages.

3. Results and Discussions

3.1. *The Production Technology of Off-Season Vegetable Farming to the Farmers*

For those farmers continuing off-season production technology, nearly all applied all six components of the technology package, including the heat tolerant variety, seedling nursery, raised planting beds, chemical fertilisers, rain shelters, and plant growth regulators. One farmer did not use a seedling nursery or raised planting beds, while another did not apply a plant growth regulator.

Off-season vegetable production technology can be gained by using different agro-climatic regions, maintaining or adjusting planting time, selecting varieties, and creating artificial and controlled environments through tunnels, polytene houses, glass houses, hotbeds, etc. Access to mechanisation, quality and improved seeds, fertilisers, technology packages and technical services is considered a prerequisite for enhanced technology adaptation that is necessary for the transformation of subsistence agriculture. Therefore, providing improved and modern agricultural inputs to farmers is essential in using agriculture for rural development.

3.2. *Economic Gains of Off-Season Vegetable Farming to Farmers*

The economic gains of off-season vegetable farming to farmers were assessed. Among these gains, off-season vegetables help farmers earn and show the highest rank with an overall mean score of 1. This was followed by the fact that it is an excellent source of preventive food that contributes to nutritional security and if production is qualitative and massive. There is a chance of exports to foreign countries, providing year around employment opportunities and high earnings, ranked 2nd with a mean of 0.91; it instils confidence in farmers that make vegetable farming their primary profession, ranked 3rd with a mean value of 0.68, the last is Consumers can have fresh products throughout the whole year even in Off-Season, and Farmers can build their knowledge; learn ideas and specific techniques develop confidence so that they can start this technology in commercial scale ranked 4th with a mean score of 0.2 respectively. A farmer-based organisation can empower farmers and give them the advantage of overcoming the exploitation of farmers by prospective buyers [32]. The provision of possible support and training to the farmers can lead to systematic farming concerning food security [33].

3.3. *The Constraints of Off-Season Vegetable Farming to the Farmers*

The interviews that were held with respondents indicated that off-season farmers were confronted with a myriad of problems. Nearly all the trained farmers said their primary constraint was the high incidence of pests and diseases. They felt they had to spend a lot of money on pesticides, and some were concerned about their health. Farmers also mentioned the high investment costs of rain shelters and the lack of access to quality tomato seed. Many farmers felt that off-season tomato production required much of their time when they were already occupied with other crops. Many farmers also felt that profits were lower than expected because yields were disappointing and costs were higher than anticipated.

Likewise, the accessibility of road networks for transportation from farmland to market centres and irrigation is added value for the farmers. In contrast, a study conducted in the Dhading district revealed that the lack of transportation facilities is the primary constraint of vegetable marketing. Meanwhile, vegetable diseases tend to be another notable constraint in vegetable farming, resulting in losses in production and depriving farmers of expected profits [34]. Vegetable diseases have also become a

significant challenge that has prevented farmers from receiving good returns [35]. Vegetable diseases are crucial, resulting in maximum pre-harvest loss [36]. The increase in farming inputs is significantly associated with the emergence of diseases, which added extra financial burdens to the farmers. In accord to previous studies revealed that the lack of a proper irrigation system has also impacted agricultural returns, and a deficiency in the supply of quality seeds is a constricting factor for vegetable production [37, 38].

The need for infrastructural assets like the proper marketing yards and collection centres with excellent storage systems are the constraints that limit farmers from selling their products through contractors in other places. Familiar voices of farmers about the limitations of vegetable farming are as follows:

Vegetable prices are very unpredictable, especially tomatoes, which we cultivate more as commercial vegetables. Even if we have good production, we do not benefit as the middleman. They can earn more than five times what a farmer can earn annually. On the other hand, vegetable diseases lower production, and sometimes, the condition remains unmanageable to have the expected returns.

Limited access to land is still a significant constraint to farmers' full participation in the season. Available evidence indicates that the distribution of land ownership is heavily skewed toward men. Most men usually do not have ownership of land and assets because traditionally, only sons inherit the family land [16, 39]. Also, in support of the result, a previous posit that "lack of sufficient capital tends to farmers ability to develop new products and services or to grow to meet demand" [40]. An earlier study supporting this current study points out that business start-ups that failed did so because of the owners' need for more management skills [41].

Similarly, the need for more financial resources, the shortfall in marketing and management expertise, and weaknesses in external information and linkages limit their competitiveness [42]. These problems have affected all those operating within Ghana's informal sector, with women being the most affected. Most farmers still need access to land, credit, technology, fertiliser, education, employment, and political power, as evidenced in the literature [43, 44]. Often, they also have more limited access to family labour and need more resources to hire labour for their farming and other economic activities. In addition, their time constraints make it difficult for them to benefit from skills training, health programs, and other development activities.

A similar scientific study endorses the findings of this study, which shows that Ghanaian women engaged in enterprise development could not expand their businesses because they were not able to obtain financial assistance from the banks [45]. Despite their situation, women have played significant roles in their societies' socio-economic growth and well-being. They can be described as agents of development because they have played tremendous roles in the economy's formal and informal sectors through creativity and innovations.

More so, women contribute to developing countries' agricultural and rural economies [46]. Yet off-season farmers face several constraints to agricultural development, like lack of capital and access to institutional credit, lack of technical skills and access to extension, workload, less access to irrigation and modern and limited access to land that may affect them more than men [16, 47-48]. These constraints further limit the participation of women and their efficiency in the agricultural and rural development of the country, as discussed below [49]. It is believed that extension can increase farm productivity and rural income by bridging the gap between new technological knowledge and farmers' practices [50]. Providing agricultural extension services is also essential in using agriculture for development [47]. As women form a large segment of the farm workforce, they deserve increased attention in agricultural extension services in every developing nation [51]. A similar study reported that "poor provision of extension service

is a major obstacle for agricultural and rural development" [47]. This implies that the Ministry of Food and Agriculture should collaborate with technical universities to train more extension officers to offer technical support to farmers in the country.

4. Conclusions and Recommendations

It is evident that off-season cultivation is profitable and significantly impacts the farmers' consumption expenditure and food security status. Based on the results, several policy implications can be drawn. More investment in research and development is needed from donor and government agencies to develop resistant varieties of off-season vegetables since the farmers reported that frequent insect and disease attacks were the primary constraint of off-season tomato cultivation. Efforts are needed to disseminate the off-season cultivation technique to different parts of the country. The cost of production is higher for off-season cultivation compared to rainy-season cultivation. Steps to diversify sources of income, as well as access to low-interest credit, can increase the availability of capital. Higher income may have a positive effect on reducing poverty in the country. Higher consumption expenditure and food security status may play a vital role in reducing malnutrition. Thus, there is a need to promote the role of off-season cultivation in anti-poverty programs, especially in developing countries like Ghana.

Access to mechanisation, quality and improved seeds, fertilisers, technology packages, and technical services is considered a prerequisite for enhanced technology adaptation necessary for the transformation of subsistence agriculture. Therefore, it is recommended that providing improved and modern agricultural inputs to off-seasoning farmers is essential in using agriculture for rural development. Also, the government and stakeholders should support off-season farmers to improve productivity in the country.

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