

Review Article

A Brief Overview about the Health Benefit of Garlic and Study of Cultivation Environment Aspects and Special Recommendation to Zambia

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Abstract

The agricultural sector in Zambia supports livelihoods of 85% of the population. Maize is the principal cash crop (65% of cropped land) as well as the main staple crop. Other important crops include soybean, cotton, sugarcane, sunflower, wheat, sorghum, pearl millet, cassava, tobacco and various vegetable and fruit crops. Unlike elsewhere in sub-Saharan Africa, agriculture is relatively unimportant in Zambia's economy compared to mining (primarily copper). It contributes less than 20% of Gross Domestic Product. But Zambia has potential for significant increases in agricultural output currently, less than 30% of potentially arable land is cultivated. In the past, the agriculture sector suffered from low product prices, difficulties in availability and distribution of credit and inputs, and shortage of foreign exchange [1]. Copperstone University Department of Health science studies the Garlic Health benefits and cultivation economic scope in Zambia in this exclusive review article. Garlic (*Allium sativum* L) is a constant plant in the National List of Medicinal Plants of Interest to the Unified Health System (RENISUS) of Brazil, which has been used for thousands of years as a spice for cooking and medicinal herb, and several of its compounds have already been identified and studied for their pharmacological effects [2]. The aim of this Zambia Copperstone University Department of Health Science systematic review indicates the health benefits and future cultivation economic scope in Zambian farmers.

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Introduction

There are three major categories of farmers in Zambia, defined in terms of the land area cultivated by each farmer. *Small-scale farmers*, who are the vast majority, cultivate less than five hectare, use few external inputs, and consume most of their produce, occasionally entering the market to sell any surplus. The hand hoe is the predominant means of cultivation. *Medium-scale farmers* cultivate between 5 to 20 ha. They use improved seeds and fertilizers and sell most of their production. These farmers commonly use a combination of manual, animal draft power and tractors. *Large-scale commercial farmers* plant over twenty ha annually. These farmers apply high levels of purchased inputs and use oxen or machinery for farm operations. They produce almost exclusively for direct market sale or feed their grain to livestock kept on the farm. Large-scale farmers make up only 4% of farm households, but cultivate 22 per cent of all cropped land.

Crop yields depend on the production circumstances, with higher yields on commercial farms and low yields on small-scale farms. Annual maize production in Zambia was on average 1.1 Mt in the period 2000 to 2010, and average yields of about 1.5 t/ha that have not significantly changed over the past 20 years. Zambia produced an annual average of about 24,000 metric tons of sorghum and 42,000 metric tons of millet between 1987 and 2008. Such analysis resulted in 55 articles of interest on garlic, from these ones cardiovascular potential and antioxidant activity were the therapies that concentrated the largest amount of studies. This evaluation highlights the validation of important effects and pharmacological properties of garlic and its constituents which can be excellent options for the treatment of diseases. Based on this review deeply study the cultivation environment and economic scope in Zambia.

Literature Review

Although garlic can grow in different types of soil, loamy soil with natural drainage is optimum for this crop. It grows at an altitude of 1200 to 2000 m above sea level. It is sensitive to acidic and alkaline soils hence, a pH of 6-8 is suitable for optimal growth of garlic. A clayey, water-logging type soil is also not suitable for garlic growing. Soils with rich organic content, good moisture, high amount of nutrients aid in proper bulb formation(3). A heavy soil with less moisture and more water logging would result in deformed bulbs. Soils with poor drainage capacity causes discolored bulbs. Loam soil is considered very suitable for this crop. The soil which has a good amount of drainage along with the amount of carbonic material, is considered best for this crop. The growth of its tubers in sandy or loose land is not possible, due to which the yield is low. The amount of Nitrogen needed by garlic is more than most farmer's think, mostly during its initial growth phase as it spreads its leaves. Adding organic manures, like as cow and poultry dung, are a great way to add nitrogen to the soil [4]. The Zambia soil content and environment is suitable for cash crop garlic and farmers will cultivate in future good economic and export scope is to be higher in future.

Research Methodology and Recommendation

From this innovative research we took some data about Zambia cultivation field part. Based on that Zambia is divided into three major agro-ecological regions (Regions I, II and III), which are primarily based on rainfall amount but also incorporate soils and other climatic characteristics. Semi-arid Region I includes areas of southern, eastern and western Zambia: Zambia's valleys at 300-800 m altitude mostly lie in Region I. Mean annual rainfall in Region I ranges from 600 to 800 mm. The growing season is relatively short (80-120 days) and risky for crop production, as poorly distributed rains result in crops enduring frequent dry spells. Region I contain a variety of soil types, ranging from slightly acidic loamy and clayey soils with loam topsoil, to acidic sandy soils. Characteristics of these soils which have significant constraints for crop production; Region II includes much of central Zambia, with most of Central, Southern, Eastern and Lusaka provinces. It contains the most fertile soils and most of the country's commercial farms. Annual rainfall in Region II averages 800-1000 mm, and the growing season is 100-140 days long. Distribution of rainfall is not as erratic as in Region I, but dry spells are common and reduce crop yields, especially on the sandier soils. Average means daily temperatures range from 23- 26°C in the hottest month October to 16-20°C in the coldest months of June and July. The most common soils in Region II are red to brown clayey to loamy soil types that are moderately to strongly leach. Physical characteristics of the soils that affect crop production include low water holding capacity, shallow rooting depth, and top soils prone to rapid deterioration and erosion. These soils also have low nutrient reserves and retention capacity, are acid, have low organic matter and nitrogen content, and are phosphorus-deficient.

Region III, the high-rainfall area, lies in a band across northern Zambia, including the Northern Luapula Copper belt, Northwestern provinces and some parts of the Central province. This region receives over 1000 mm of precipitation each year, and the growing season ranges from 120-150 days. Soils in Region III are highly weathered and leached, and characterized by extreme acidity. Consequently, the soils have few nutrients available for plant growth, and are high in exchangeable aluminum and manganese, both of which are toxic to most crops unless soils are limed to increase pH.

In the Luangwa Valley, sorghum, finger millet and maize are the major starchy food crops, while groundnuts, cowpeas and pumpkins are also grown. Farmers use hand hoes for cultivation. Goats and chickens are commonly kept by farm households, and some farmers have a few cattle. Other areas of the region mainly produce bulrush millet, sorghum, and cassava [5].

Zambia's large commercial farmers are concentrated in Region II. Their farming systems are mechanized and highly diverse, cultivating maize, soybeans, wheat, cotton, tobacco, coffee, vegetables, and flowers, and breeding livestock. Besides these large-scale systems, there are also small- and medium-scale farmers in the region. Maize is the main staple crop in these systems in Central and Eastern provinces. Beans, groundnuts, pumpkins, and cassava leaves are grown to diversify diets. Other crops include cotton, sorghum, soybeans and sunflower. Cattle, chickens, goats, pigs and sheep are common. Farmers also grow tobacco. Cattle are important for traction, meat, milk and manure. The major constraints to increase crop production in Region II are the lack of low-cost biocides to control pests and diseases, soil degradation, and the depletion of soil fertility. Garlic thrives well under fairly cool to warm temperature conditions. The most ideal growth

temperature for garlic is 13 to 24°C(6) The plants are also influenced by day length but to a lesser extent than temperature. Long days and high temperatures during the growing season encourage bulb formation. Early cultivars are more likely to react to changes in temperature than late cultivars.

Small-scale farming predominates in Region III. Rural areas of this region have the lowest population density in Zambia. Farmers use very low-input, shifting and semi-permanent cultivation techniques. Principal crops in the hand hoe system of Northern, Luapula and Northwestern provinces are cassava, landrace maize varieties, sweet potatoes, pumpkin, finger millet and beans. Garlic is grown as a multipurpose crop in Zimbabwe. It is commonly used as a flavorings additive in meaty relishes, sauces, soups and also as a medical remedy to treat flu, blood pressure(7). Garlic is not very popular in open vegetable markets but can be found in most reputable supermarkets. This guideline informs existing and potential growers of how best to grow garlic. But in Zambia Garlic cultivation is limited area only but domestic market price is very higher .There are two types of garlic grown in Southern Africa, hard neck and soft neck. Hard neck varieties (*Allium sativum* var. *ophioscorodon*) bolt during early summer producing a tall, flower stalk. Bulbils, which are small aerial cloves, are produced .There is considerable variability in the size and number of bulbils produced by hard neck garlic varieties [8] Garlic is one crop which requires relatively high levels of soil moisture throughout the growing period but over watering must be avoided. Any periods of dry soil conditions, especially during bulbing will result in yield reductions [9]. In areas that have variable rainfall, it is advisable to irrigate the crop (figure 1).

Example of Garlic Cultivation Stages

1. Pure Seeds
2. Plant bulb
3. Planting Method
4. Irrigation method
5. Garlic Farm

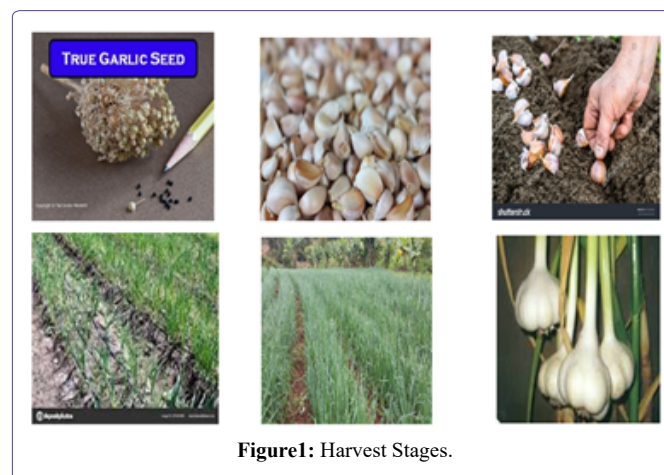


Figure1: Harvest Stages.

Health Benefit of Garlic

Current research shows that garlic may have some real health benefits, such as protection against the common cold and the ability to help lower blood pressure and cholesterol levels .Garlic has high

antioxidants, which help prevent any oxidative damage from occurring in your body. These antioxidant properties can help prevent certain cognitive diseases like dementia and Alzheimer's. Raw garlic retains higher amounts of allicin, a beneficial sulfur-containing compound. Garlic has been shown to improve immunity, stabilize blood sugar levels, and support heart and brain health(10). A mineral present in Garlic, called selenium can cleanse the liver. It can trigger liver enzymes, and naturally flush out the toxins from your body. The new-age super food can cleanse the arteries, and help in getting rid of the liver toxins. You'll get the most benefit from raw garlic," says Jeffers. "But if you choose to cook it, don't heat it above 140 degrees Fahrenheit (60 degrees Celsius). Higher temperatures kill the allicin, so add garlic to your re A single clove (3 grams) of raw garlic contains Manganese: 2% of the daily value (DV) , Vitamin B6: 2% of the DV, Vitamin C: 1% of the DV ,Selenium: 1% of the DV, Fiber: 0.06 grams This comes with 4.5 calories, 0.2 grams of protein, and 1 gram of carbs and also Garlic also contains trace amounts of various other nutrients(11). Garlic is very easy to include in your current diet. It complements most savory dishes, particularly soups and sauces. The strong taste of garlic can also add a punch to otherwise bland recipes. Garlic comes in several forms, from whole cloves and smooth pastes to powders and supplements like garlic extract and garlic oil.

Proven Health Benefits of Garlic are

- Garlic contains compounds with potent medicinal properties
- Garlic is highly nutritious but has very few calories
- Garlic can help protect against illness, including the common cold
- The active compounds in garlic can reduce blood pressure
- Garlic improves cholesterol levels, which may lower the risk of heart disease
- Garlic contains antioxidants that may help prevent Alzheimer's disease and dementia
- Garlic may help you live longer
- Athletic performance might be improved with garlic supplements
- Eating garlic may help detoxify heavy metals in the body
- Garlic may improve bone health
- Garlic is easy to include in your diet and adds flavor.

Discussion

Single or multiple rows of plants are commonly used. However, the general recommendation for spacing is 8 to 15cm between plants and 30 to 40cm between rows. The cloves are planted to a depth of about 50mm on raised beds or on the flat. Garlic can be successfully grown using furrow, sprinkler, or drip irrigation. Garlic has a relatively shallow root system and it is, therefore, sensitive to moisture stress throughout the growing season. The quantity of water that should be applied depends on the weather and the soil conditions. Furthermore, there will be increased water demand during hot, dry weather conditions(12) Where the conditions like this prevail, mulching is recommended to reduce the rate of moisture loss from the soil surface(13). The frequency and the rate of irrigation can also be determined by using the moisture determining devices such as neutron probe around the field. The preferred time of irrigation is morning to mid-afternoon,

thus, allowing sufficient time for the plant foliage to dry before night-fall. As garlic matures, irrigation should cease. This increases harvesting ease and reduces potential deterioration and staining of exterior bulb sheath leaves.

Conclusion

If you're a small scale Zambian farmer will look garlic cultivation is to be one of the easiest and most profitable cash crops in coming years. The state of Zacatecas has the highest production of garlic, and produces about 3,000 hectares. Ávila says: "Throughout the whole country, approximately 6500 hectares of garlic is produced. On average we see a yield of 14,000 kilos of garlic per hectare. In fact, garlic can produce an income of up to \$10 per square foot, so even a small garlic patch can bring in thousands of dollars(14). One of the best ways to profit from a garlic crop is to "add value" by selling garlic products in addition to fresh bulbs. Low yields in the Fall River Valley and Big Valley can be 8,000 pounds per acre or less. High yields can be over 15,000 pounds per acre. Average yields will be in the 10,000 to 12,000 pound per acre range depending on clone, management and environmental conditions. At planting, broadcast about 125g/m², 3:2:3 granular fertilizers. During the growing period, which lasts about six to eight weeks after planting, apply 40g/m² of 3:2:3 as a light side-dressing. Garlic is successful under furrow, sprinkler, or drip irrigation. we can plant garlic in the rainy season but it's not recommended as the resulting garlic bulbs will not reach the size they would have if they were planted in the start of the dry season. They will still be tasty but they'll be smaller than they could have been.

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