

Factors Affecting Sweet Potato Production in Umsmu, NongthymmaiKyrдем and Umdamli Villages of RiBhoi District, Meghalaya

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ABSTRACT

The study was conducted in Umsmu, NongthymmaiKyrдем and Umdamli villages of Umsning block of RiBhoi District of Meghalaya during 2019. Sweet potato is one of the most important oldest and annual tuber crops of Meghalaya and is known as “PhanKaro” or “PhanThiang” in the local language. Both primary and secondary data were used for the present study. Primary data was collected from farmers of Umsmu, NongthymmaiKyrдем and Umdamli villages using a random sampling technique. The present investigation reveals that soil quality of these villages is not feasible for the growth of sweet potato plant. The results obtained served as a guide for the basic requirement necessary for the healthy growth of sweet potato. Based on the present study improved varieties of sweet potato may curtail the extent of breakdown and sources of pests and disease transfer.

Keywords: Sweet potato, Low production, Physico-chemical characteristics, Socio- economic status.

INTRODUCTION

Sweet potato (*Ipomoea batatas*) is widely grown as a staple food in many parts of tropic and sub tropics and is the third most important tuber crop in the world (Kyamanywa *et al.* 2011). It is a dicotyledonous plant that belongs to the morning glory family Convolvulaceae (Edmond *et al.* 1971). It is large starchy, sweet in taste, tuberous root and is good for growth and health of an individual. Sweet potato is an important food product for consumption and is rich in vitamin A with sufficient quantities of a precursor known as beta-carotene.

In some countries the young leafy shoots, which are eaten as a green vegetables, particularly in Asia, are high in protein (approximately 20% of dry weight) and are also a good source of carotene, thiamine (vitamin B1), riboflavin (B2), folic acid and ascorbic acid (Villareal *et al.* 1985). Sweet potato ranks seventh in the world for its food value (Amamgbo and Wachukwu 2008, Agbo and Ene 2011) and is known as “poor man’s food” (Andrade *et al.* 2009).

Sweet potato is one of the most important annual tuber crops of Meghalaya and is known as “PhanKaro” or “PhanThiang” in the local language. It plays an important role in the diet of the villagers. As sweet potato is rich in its caloric content it is also used as live-stock feeder. Sweet potato is cultivated in large scale by the farmers of this region and sold in the market for

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purchasing essential commodities and feed for their domestic animals. Change in the weather condition is playing a major role in decline of sweet potato production in the region. Due to lack of knowledge people of this region are unaware of its nutrient content; as a result market value of sweet potato is very low.

According to the farmer's production of sweet potato are constrained by high cost of fertilizer, poor soil quality, diseases and pests problems. Sweet potato remains a key component in livelihood system of the farmers, contributing to food security as a direct food source and as cash crop of farmers in the study area.

The present study could be justified in many ways, through identification of problems faced by the sweet potato farmers. Policy options could be instituted by the locals on how best to overcome the constraint to boost production.

Study area

The study was conducted in the State of Meghalaya (Fig.1) situated in the North Eastern region of India, running between Bangladesh on the South and West and Assam on the North and East. Meghalaya lies between 24° 58' N to 26° 07' N latitudes and 89° 48' E to 92° 51' E longitudes. RiBhoi District came into existence on the 4th June 1992 with Nongpoh as the District Headquarters.

The District consists of three Community and Rural Development Blocks that includes Umsning C and R D Block with its headquarters at Umsning, Umling C and R D Block with

its headquarters at Nongpoh and Jirang C and R D Block with its headquarters at Patharkhmah.

The present study was conducted at Umsmu, NongthymmaiKyrдем and Umdamli villages of Umsning block of RiBhoi District.

Objectives of the study

1. To determine the socio-economic condition of sweet potato farmers in NongthymmaiKyrдем and Umdamli villages;
2. To analyze the physico-chemical characteristics of soil;
3. To determine the effect of environmental factors in the production of sweet potato.

MATERIALS AND METHODS

Both primary and secondary data were used for the present study. Primary data were collected from farmers of Umsmu, Nongthymmai Kyrдем and Umdamli villages using a random sampling technique, with a set of questionnaire, direct interview method, group discussion and field observation.

Soil samples were collected from different plots (sweet potato) of land. For collection of soil, random sampling technique was used by zigzag sampling method i.e. low land and high land. The soil samples collected was analyzed in the laboratory. The parameters taken into consideration were (i) Nitrogen content by alkaline permanganate method in kg/ha (ii) Phosphorus content by Olsen's method in kg/ha (iii) Potassium by Bray method in kg/ha (iv) Organic

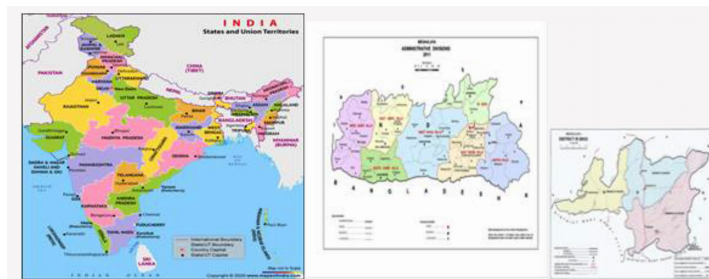


Fig. 1. Location map of the study area .

carbon used as a measure of nitrogen content kg/ha (v) pH (vi) Conductivity and (vii) Micronutrients e.g. zinc, iron, manganese and copper in parts per millions (ppm).

The recommended time for planting of sweet potato is late May through June, when the rains are steady. Since last few years plantation is delayed till the month of July.

RESULTS AND DISCUSSION

Socio economic characteristics of farmers

Majority (71.3 %) of the farmers interviewed was female and the male farmers were 27.7 % (Table 1). Females are heading the houses in the study area and a great percentage of women control the land tenure and work in the field. Majority of the women farmers are single mothers, challenged by the absence of capital, information and access to markets which prevents them from producing enough to fulfill the basic necessities of their household and children's education.

The age range of the farmers was between 19 to 70 years. Majority of the farmers are between the age range of 37 to 40 years of age, indicating that middle aged people are more into sweet potato production. The elderly farmers were more experienced and according to them there is a change in the pattern of rainfall past 10 to 15 years. According to the farmers sweet potato productivity has declined over the last decade due to erratic weather conditions. The weather pattern is becoming worrisome for the farmers. Age distribution of the farmers as it has affected soil moisture content and soil erosion, both of which are very important for healthy yield.

Looking at the literacy status of the respondent it is observed that 76% of the farmers did not have

Table 1. Gender.

Gender	Frequency	Percent	Valid percent	Cumulative percent
Male	28	27.7	27.7	28.7
Female	72	71.3	71.3	100.0
Total	101	100.0	100.0	

any formal education followed by 11% completing only primary level of education (up to 8th standard) (Table 2). 6 % completed up to secondary standard i.e. up to class ten 6 % completed higher secondary level of education that is up to class twelve and only 3 % farmers were graduates. The reason behind low literacy rate may be due to poverty, high dependency on farming and not many schools in the area. Present investigation revealed educated farmers have substantially greater ability to adaptation to the present situation compared to the illiterate farmers. Educated farmers are ready to uptake adaptation strategies

During focus group discussion the farmers reported due to uncertainty of onset of rains planting at different dates make a planning calendar difficult. Table 3, 51% of the farmers reported they delayed their plantation by more than a month, 36 % were of the view that they delayed plantation by one month and 13 % delayed plantation by few weeks.

The estimates of potential sweet potato losses due to various biotic and abiotic factors averaged 30%, 20% and less than 20% respectively (Table 4). Loss data can play an important role in creating awareness of the need for pest control and the need to improve management strategies. Economic losses are increasing everyday due to low pricing for sweet potato. In the study it was also observed that small and marginal female farmers in the rural areas lack knowledge on current prices of their products, the current trends in demand and supply conditions and hence incur many losses.

Soil samples were collected from different sites to estimate the physico- chemical characteristics. pH is one of the most important ecological parameters.

Table 2. Educational qualification.

Class	Frequency	Percent	Valid percent	Cumulative percent
No formal Education	76	76.0	76.0	76.0
One to Eight	11	11.0	11.0	87.0
Nine to Ten	6	6.0	6.0	93.0
Eleven and Twelve	4	4.0	4.0	97.0
Degree	3	3.0	3.0	100.0

Table 3. Impact of rainfall on cultivation.

Change in plantation date	Frequency	Percent	Valid percent	Cumulative percent
More than a Month	51	51.0	51.0	51.0
One Month	36	36.0	36.0	87.0
Few Weeks	13	13.0	13.0	100.0
Total	100	100.0	100.0	

pH value of the soil samples varied from 4.43 to 5.17. Sweet potato is tolerant to variations in soil pH between 5.5 to 6.8 which is alkaline in nature and yield is usually high. From our study it has been observed that the soil pH is acidic in nature which may be a factor in low production of sweet potato. Soluble salt content in between 1 to 2 mhos is critical for the germination of crops like sweet potato. Salt content above 3 mhos causes injury to crops. In the present investigation, the value of conductivity of soil varied from 0.7 to 0.37 mhos.

Nitrogen content of the soil varied from 0.4 to 2.5 (250.88 kg/ha). Normal range of nitrogen for sweet potato cultivation is 280 to 560 kg/ha. Nitrogen content of soil was far below the required range. Nitrogen is an important element for sweet potato growth for its proliferation. Reduced nitrogen content of the soil resulted in reduced plant growth and potato production in Umsmu, NongthymmaiKyrдем and Umdamli villages.

Phosphorus (P)

Phosphorus (P) content in the soil is a macronutrient that is required for the growth of sweet potato. The normal range of P in the soil should be 10 to 24.6 kg/ha. Soil collected from the study site gave a reading of 43.68 kg/ha. Excessive P in sweet potato cultivation results in increase in weed growth and helps in the development of root fungi which help the plant to absorb water and nutrients. It increases the intake of zinc and iron which results in bleaching of plant tissue and yellowing between leaf veins.

Potassium (K)

Potassium is another macro-nutrient that is present in the soil for plants growth. As sweet potato has an ex-

Table 4. Crop loss.

Crop loss	Frequency	Percent	Valid percent	Cumulative percent
25 to 30 %	72	72.0	72.0	72.0
20 %	20	20.0	20.0	92.0
Less than 20 %	8	8.0	8.0	100.0
Total	100	100.0	100.0	

tensive root system the plant require sufficient amount of potassium. The normal range of potassium in soil should be 108 to 280 kg/ha for growth of sweet potato. Potassium content of soil in the study area ranged from 179.5 to 313.6 kg/ha. Excess of K disrupts the uptake of other nutrients, such as calcium, nitrogen and magnesium, creating deficiencies in sweet potato which includes brown scorching and curling of leaf tips as well as chlorosis between leaf veins. In the study area sweet potato tuber size is much reduced and crop yield is low.

Micronutrients are a form of chemical elements which are essential components for plants growth. It includes Fe, Mn, Zn and Cu. Available Cu content of the soil sample varied from 0.68 to 2.24 ppm. Standard range of Cu required for sweet potato cultivation is 0.2 to 0.4 ppm. The micronutrient status in the soil samples from the villages depicted that the soil quality is not feasible for cultivation of sweet potato. Excess copper is highly toxic to sweet potato, concentration as low as 5 μ M in the root zone being sufficient to cause significant growth reduction. As Cu toxicity usually results from excessive application of copper, prevention rather than correction should be stressed. Heavy application of phosphorus fertilizers may reduce the availability of Cu to sweet potato. Zinc content of the soil ranged from 0.204 to 2.122 ppm. Standard range of zinc in the field must be from 0.5 to 1.00 ppm for sweet potato cultivation. Excess of Zn interferes with the fertility of the soil and creates a microenvironment not suitable for growth.

Iron content in the soil varied from 0.7018 to 0.9148 ppm which is much below the standard range of Fe required from healthy growth of sweet potato, which is 5 ppm. Manganese content in the soil ranged from 1.798 to 4.646 ppm. Normal range of Mn is 5 ppm to 10 ppm. There was leaf senescence due to Mn deficiency.

High cost of transport was complained by majority of the farmers. Transportation problem makes some of the farmers to sell their sweet potato at cheaper rate at the farm.

CONCLUSION

Sweet potato acts as a food security to the farmers of Umsmu, NongthymmaiKyrдем and Umdamli villages. The present investigation reveals that soil quality of these villages is not feasible for the growth of sweet potato plant. The results obtained served as a guide for the basic requirement necessary for the healthy growth of sweet potato.

Sweet potato can be utilized in this region in various forms for e.g. in confectionaries, beverages, making beer, animal feed and flour which will add to economic value to the farmers of East Khasi Hills District of Meghalaya. From the field study, it has been observed that sweet potatoes are infected with diseases which caused heavy losses to the farmers. Inconsistent soil moisture interfered as a limiting factor in sweet potato production in the villages.

Profitable and sustainable sweet potato production requires proper management of nitrogen and other micronutrient content of the soil. Excessive or inadequate amount of nitrogen is detrimental to sweet potato production. As soil pH in the study area is acidic in nature the farmers of the region need to improve in the soil quality for a better production by applying lime in an appropriate quantity. An integrated approach to farming, investment in the crop and development is imperative to strengthen the link between production and income generation in these villages.

Recommendations

Based on the present study improved varieties of sweet potato may curtail the extent of breakdown and sources of pests and disease transfer. Adult education should be organized by appropriate bodies to

equip farmers in good managerial skills and rational decision making ideas to enhance their production and productivity. Access motor able road to reduce difficulty and high cost of transporting agricultural production to the market or home for various uses.

The soil may be aerated and enriched by cultivating a cover crop or green manure that will fix nitrogen for the potato and integrated pest management techniques must be followed.

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