

Productivity and Profitability of Latiraj Kachu (*Colocasia esculenta*) to Promote Cultivation Practices in Dug Well Schemes at Joypurhat

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Abstract— A study was conducted to know the farmers' production techniques and to assess the productivity and profitability of latiraj kachu (a variety of Panikachu) at Joypurhat district. The study was also conducted to promote its cultivation practices in dug well schemes in the medium highland to low land situations. Total 10 solar powered modified dug well schemes at two upazilas of Joypurhat district with 51 farmers related to the cultivation of latiraj kachu were selected for the study. The average cost of cultivation of latiraj kachu was Tk. 229895 per hectare, in which TK. 118745 and TK. 111150 per hectare were as variable cost and fixed cost respectively. The major shares of cost were 17.73% human labor, 22.56% seeds, 3.22% irrigation, 7.36% manure and fertilizers, 0.78% pesticides, and 48.35% land use and other costs. The average yield of stolon, and rhizome and stem in total were 20 and 88.92 metric tons per hectare respectively. The highest benefit cost ratio was 3.66 on an average and the average net return was Tk. 612505 per hectare of land. In a short, it can be said that the cultivation of latiraj kachu was more profitable than the other vegetables in the study area. It is now a very popular vegetable all over the country.

Keywords— Dug Well Irrigation; Latiraj Kachu Cultivation; Productivity; Profitability.

I. INTRODUCTION

Arum (*Colocasia esculenta*), known as kachu in Bangla, is a green vegetable and a variety of tuber crops. It is grown very well in tropical countries. This vegetable crop is comparatively higher yielder and less susceptible to insects, pests and diseases. Every part of this vegetable/plant like leaves, stems, rhizomes, stolon are edible and consumed. In Bangladesh, farmers cultivate seven varieties of arum that include 'man kachu, pani kachu, mura kachu, lati kachu, sak kachu, owl kachu and mukhi kachu and all these are consumed by the people [1]. Mukhi kachu and pani kachu are the most important and commercially grown in all parts of the country. Among all the arum crops, panikachu is a nutritious vegetable contributing to the total supply of vegetables during the summer season in Bangladesh. The whole part of panikachu including leaf, petiole, rhizome, corms, flowers, stolon, in which most parts contain protein, carbohydrate, and calorie [2], are edible for animal and human beings in different ways. Many farmers cultivate this crop from their innovative ideas. It is grown in Bangladesh in kharif season with supplemental irrigation and contributes a considerable part on the total supply of vegetables.

Stolon, stem and rhizome are the main edible organs of latiraj kachu, and though they are primary for stolon, the rhizomes which are not of good quality may be considered for some other uses. The stolon, emerging continuously from the base of the developing sucker corms, are highly acceptable as vegetable due to its non-acridity and taste [3,4]. Latiraj kachu is famous for the production of good quality stolon. It is highly nutritious and palatable. Stolon contains 1.12 g iron, 38 mg calcium, 500 IU vitamin A, 38 mg vitamin C and 35 kilocalorie food energy under 100 g edible portion [4,5]. In Bangladesh, stolon producing latiraj kachu occupies an area of

about 6,777 hectares, with a total production of 41521 metric tons of stolon, and an average yield of 6.13 metric tons per hectare in 2018-19 [1]. Generally, it is harvested throughout the kharif season, when vegetables are deficit in the market. So, it can easily meet up the demand of vegetables at that time. It can grow easily with less care and input. Moreover, disease and insect infestations are less in case of latiraj kachu. Thus, there is a great opportunity to improve its production and quality through nutrient management [3,4,5,6].

Latiraj kachu is an improved variety of pani kachu (*Colocasia esculenta*), known as taro, can be grown in both the plain wet land and the seasonally flooded land, and can survive a certain period under water. The main reason of cultivation of latiraj kachu is that small farmers are able to grow it easily even on their flooded lands and has a disaster prevention capacity [7]. Latiraj kachu, known as BARI (Bangladesh Rice Research Institute) Panikachu-1, has given the highest stolon yield (around 23 to 24 ton per ha) which differed significantly from other varieties and the highest gross return and gross margin than other varieties of kachu. The market price of stolon was Tk. 10.00 per kilogram and rhizome was Tk. 6.00 per kilogram in 2010-11 [8]. Now it (stolon) has raised to Tk. 27 per kilogram. Latiraj kachu is now a more profitable and people accepted vegetable in all over Bangladesh. So, emphasis should be given on its production practice and capacity.

However, the present study was conducted to evaluate the performance of latiraj kachu under farm condition and popularize them among the farmers in dug well schemes to promote its adoption in the study area.

The specific objectives of the study were:

- i) to determine the existing production practices;
- ii) to promote the performance of latiraj kachu in dug well schemes in the study area;

iii) to popularize and disseminate the production performance and benefits of latiraj kachu among the farmers, and
iv) to increase the yield of the vegetable and farmers income generating activities.

II. DATA COLLECTION AND ANALYSIS

The study area was Joypurhat district of Bangladesh. Two upazilas, namely, Joypurhat Sadar and Panchbibi, of Joypurhat district were selected for this study, where 10 solar powered modified dug wells were installed through BMDA (Barind Multipurpose Development Authority). Around 667 farmers were involved with these dug well schemes in the cultivation of various less water consuming crops and vegetables. Among them, around 51 farmers were associated with the cultivation of latiraj kachu.

A. Data Collection: Primary data for the study were collected from latiraj kachu cultivating farmers through face-to-face interview using a pre-scheduled interview. The study was conducted in the financial year 2018-19 and 2019-20. Crop production status and some related information were collected from Joypurhat agricultural offices and the rural people of the study area. The secondary data were collected from various issues of Yearbook of Agricultural Statistics in Bangladesh, Statistical Yearbook of Bangladesh, writings from various articles published in different journals, books, various internet websites, proceedings, reports, publications and annual reports etc. The crop production related initial costs of different cultivation practices and technologies were used to calculate the costs and benefits of the vegetable.

B. Analytical Techniques: Both fixed cost and variable cost were taken into account in calculating the cost of latiraj kachu cultivation. Land use cost was calculated on the basis of per year existing lease value of land. Land use cost, interest on loan, conveyance cost etc. were included in the other cost. The profitability of latiraj kachu cultivation was examined on the basis of net return and benefit cost analysis. The collected data were edited, summarized, tabulated, and analyzed to fulfill the objectives of the study.

III. MAIN FEATURES OF LATIRAJ KACHU

Aroid Variety: Panikachu-1)	Latiraj (BARI)	Main characteristics: Plant is erect, long and deep green, stolon dominant than stem, leaf green, upper portion of joint of leaf and petiole red color which is identifying character of this variety, crop duration 180-127 days, stolon length 90-100 cm, slight flat, light pink color, boil homogenously and comparatively lower calcium oxalate and free from acidity. This variety is cultivated all regions of Bangladesh.
Developed by:	Bangladesh Agriculture Research Institute (BARI), Gazipur, Bangladesh	
Bangla Name:	Panikacku (Latiraj kachu)	
English Name:	Taro	
Scientific Name:	<i>Colocasia esculenta</i>	
Family:	Araceae	
Year of release:	1988	
Planting season and time:	February to March and Kharif 1	
Harvesting time:	Harvesting start after 2 month of transplantation and continued up to 7 months	
Yield:	Stolon 25-30 t/ha and rhizome 15-20 t/ha	

Source: Department of Crop Botany, Bangabandhu Sheikh Mujibur Rahman Agricultural University [9].

Two pictures of latiraj kachu cultivation and lati (stolon) are given bellow.



Figure 1a: Latiraj kachu cultivation (with stolon).



Figure 1b: Latiraj kachu cultivation (with stolon).

IV. RESULTS AND DISCUSSION

The major cropping pattern in the study area is rice based. Different vegetables, potato, mustard, water melon, pulses, oil seeds, etc. are producing here, besides rice, jute, wheat, sugarcane etc. Traditional non-rice crops that are popular in the study area include potato, maize, lentil, black gram, sesame, mustard, chilies, onion, garlic, turmeric, brinjal, country bean, patal, tomato, cabbage, cauliflower, karla (bitter gourd), zhingra (ridge gourd), chichinga (snake gourd), kakrol (bottle gourd), carrot, radish, arum (kachu), lady's finger, grout, cucumber, pumpkin, barbate (pea bean) etc. Among these vegetables, latiraj kachu, a well-known and famous variety of arum, is very popular in Joypurhat district, though it is now growing even a small quantity everywhere in Bangladesh. Joypurhat is the 2nd highest district in Bangladesh in case of the production of latiraj kachu. Near 596 hectares of latiraj kachu was produced in 2018-19 at Joypurhat, which was around 6136 metric ton. The production of latiraj kachu at joypurhat district was around 14.78 percent of the total latiraj kachu production in Bangladesh and 62 percent of its production was in the north western part of Bangladesh [1]. The value of latiraj kachu was Tk. 27 per kg at the farmers level and the retail price was Tk. 30-35 per kg in the market in the study period. Some other vegetables other than latiraj kachu were cultivated in BMDA's modified dug well schemes from the financial year 2016-17 and till now these are cultivating. Some of them are shown in figure 2-5.

Benefit-Cost Analysis: There were two types of inputs in the cost of vegetable production. Variable costs of cultivation practices were the cost of human labor, seed, irrigation, fertilizers, pesticides etc. Among the fertilizers, Urea (for nitrogen), TSP (Triple Super Phosphate), MoP (Murate of Potash), Gypsum, Boron, Zinc etc. were used as fertilizer and cow dung was used as manure.

The local market prices of different fertilizers/manure used during study period are shown in table 1a. Also, the costs of manure and fertilizers applied in cultivation of latiraj kachu are given in table 1b. The prices of different variable inputs in the production period are presented in table 1c. Fixed costs were land use cost and interest on Bank or any other loans. It was observed from table 1c that the total cost of production per hectare of latiraj kachu was Tk. 229895 on an average.

Among the item wise input costs, the cost of seed was relatively higher (22.56%), and pesticide was lower (0.78%) for the production of latiraj kachu. Interest in operating capital, land use cost, conveyance cost etc. were included in

the other costs. Though the cost of production were relatively higher, but the latiraj kachu production in the study area was more profitable than many other crops and vegetables. The detail benefit cost ratio (BCR) of latiraj kachu is given below.



Figure 2: Cultivation of arum (kachu) in dug well scheme.



Figure 3: Cultivation of potato in dug well scheme.



Figure 4: Cultivation of patal in dug well scheme.



Figure 5: Cultivation of cabbage in dug well scheme.

Table 1a: The prices of different fertilizers and manure used in the production period.

Inputs	Urea	TSP	MoP	Gypsum	Boric acid	Zinc	Cow dung
Prices of fertilizers/manure per kg in Tk.	17	24	16	12	150	100	0.4

*Source: Field Survey, 2019-20 **All prices in Tk. (Bangladesh Taka)

Table 1b: The costs of manure and fertilizers applied in latiraj kachu.

Name of crop	Fertilizer wise costs per hectare in Tk.							Total cost in Tk.
	Urea	TSP	MP	Gypsum	Boron	Zinc	Cow dung	
Latiraj kachu	1190	1200	2880	1440	3000	1200	6000	16910

Table 1c: The costs of production and percent of costs of latiraj kachu.

	Item wise costs of manure/fertilizers per hectare in Tk.						Total costs of production
	Labor	Seed	Irrigation	Fertilizer	Pesticides	Others	
Costs in Tk.	40755	51870	7410	16910	1800	111150	229895
% of costs	17.73	22.56	3.22	7.36	0.78	48.35	100

Table 2: Production costs and benefits of the studied latiraj kachu (Tk./ ha) in Joypurhat

Crop	Yield (metric ton/ ha)	Gross return (Tk./ha)			Cost of production (Tk./ha)	Net return (Tk./ha)	Benefit -Cost Ratio (BCR)
		Main product (stolon and stem as vegetables)	By product (rhizome)	Total			
Latiraj kachu	20	546000	296400	842400	229895	612505	3.66

It was observed from table 2 that the productivity of latiraj kachu was 20 metric ton/ha (stolon) and the gross returns from main product and by product per hectare were Tk. 546000 and 296400 respectively and the total return was Tk. 842400. The net return per hectare was Tk. 612505. The BCR of latiraj kachu was 3.66, which was relative higher than many other crop and vegetables. It was revealed that the net return of latiraj kachu was found positive and the average BCR was greater than 1.00 irrespective of farm size and locations of studied schemes. Hence, it can be said that cultivation of latiraj kachu was more profitable and cost effective.

V. CONCLUSION

Once latiraj kachu was less important and low-cost vegetable. But the situation has turned into reverse with increasing market price of latiraj kachu and its high demand among the people. Now it is commercially produced in Joypurhat, specially at Panchbibi and Joypurhat sadar Upazila. It is known to all that Joypurhat district is famous for latiraj kachu production in Bangladesh. The district is the 2nd highest in Bangladesh with respect to the production of latiraj kachu.

Once it was less valuable and unpopular vegetable crop in Bangladesh. The unit price of stolon (locally called lati) was about Tk. 10 per kg near 10 years back, but the market price during study period was Tk. 27 per kg. Once it was mostly cultivating in the northern and western part of Bangladesh. But now it produces all over the Bangladesh. It is more profitable and people adapted vegetable than other crops and vegetables in Bangladesh.

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