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Evaluation of potato varieties under coconut based cropping system in South Bengal

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ABSTRACT

Two years coconut based cropping system experiment was undertaken in a thirty-eight years old coconut plantation under AICRP on palms, at HRS , Mondouri, BCKV , West Bengal during rabi season of 2018-19 and 2019-2020 with seven varieties of potato (V_1-Kufri Jyoti ,V_2 - Kufri Himalini, V_3-Kufri Chipsona-3, V_4-Kufri Garima, V_5-Kufri Chandramukhi, V_6- Kufri Gaurav, V_7-Kufri Pokhraj).They were laid out in RBD with 3 replications.Five randomly tagged plants were recorded on different characters of plants and tubers like plant height (cm), number of leaves plant^{-1}, number of shoots plant^{-1}, fresh weight g plant^{-1}, dry weight g plant^{-1}, fresh weight of tubers g plant^{-1}, dry weight of tubers g plant^{-1}, number of tubers plant^{-1}, biomass yield kg plot^{-1}, projected biomass yield t ha^{-1}, yield kg plot^{-1}and projected yield of tubers kg ha^{-1}. Kufri Garima was found promising in terms of highest B: Cratio (1.65) and net return (Rs.210432 ha^{-1} available land)and may be recommended to grow under the partial shade of coconut in South Bengal condition.

Keywords: Coconut, potato, yield, CEY, system productivity and BC ratio

Coconut being a tall palm, with unbranched trunk planted at a wider spacing of 7.5m allows remunerative raising of inter crops in the inter spaces of coconut which is virtually impossible with many other perennial tree crops. The unutilized soil resources and under story sunlight in such plantations can be used by judicious selection of compatible partially shade loving intercrops. Coconut palms being widely spaced provide sufficient scope for intercropping of different annual and perennial crops and this idea is evolved in response to the pressure of shrinking land resource base coupled with a high population density, which necessitated a conscious attempt by farmers to achieve their goals by living within biophysical, ecological and economic constraints. As feeding roots of coconuts are confined within 2m radius of the crown therefore growing of different crops inside the coconut garden is also an age old practice. Based upon the rooting pattern of coconut more than 95 per cent of the roots are found in the top soil ranges between 0-120 cm out of which 19 and 63 per cent of roots are confined to 0-30 cm top portion of the soil within a depth of 30-90 cm, respectively (Maheswarappa *et al*., 2000). In a coconut tree active root zone is mostly confined within the radius of 2 meters from the bole and coconut root footage only in 25 per cent of the land surface laterally (Rethinam, 2001). Therefore, the remaining 75 per cent of the land area can efficiently be utilized for raising of intercrops.Adoption of cropping systems in the interspaces available in the coconut plantation and utilization of available natural resources like soil, water, light and other inputs such as fertilizers, labor etc., are properly being utilized to produce nuts, edible and non-edible items in a profitable manner.The basic natural resources like soil and sunlight available in coconut garden are not fully utilized under mono-cropping system. Intercropping is one of the agronomic strategies for efficient utilization of resources other than higher farm income. As choice of the crop components are mostly influenced by the climatic requirements and dietary habits of the local people based upon that the technique of growing inter crops in coconut plantation has been standardized by Nelliat (1979). Bavappa *et al*. (1986) reported that high density multi-species cropping system (HDMSCS) involving several species of seasonal, annual, and perennial crops evolved to meet their demands due to highly efficient use of resources. It was already reported by number of researchers (Nair, 1979; Liyanage, 1974; Bavappa, 1976; Varghese *et al*., 1979) that growing of seasonal, annual and perennial crops in the inter space of coconut plantation was reported remunerative by many of the researchers. But information related to growing of potato as inter crop in coconut garden is very meager. Therefore, to judge the performance of different varieties of potato in coconut garden as coconut based cropping system, a two years experiment was conducted to evaluate the potato varieties suitable under coconut based cropping system along with cost benefit ratio.

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MATERIALS AND METHODS

The investigation was carried out in a 38 years old coconut plantation of AICRP on palms during *rabi* season of 2018-19 and 2019-2020 at Horticulture Research Station, Mondouri, BCKV, West Bengal and in the laboratory of the Department of Plantation, Spices, Medicinal and Aromatic Crops, BCKV for evaluation of potato varieties under coconut based cropping system in West Bengal. The research station is located at latitude of $23^0$50' North, Longitude of $80^0$02' East and at altitude of 9.75 meters above mean sea level.The coconut palms were planted at a spacing of 7. 5m x7.5m distance. Before planting of potato in the month of November 2018 and 2019 the experimental plots *e.g.* interspaces in between the palms were ploughed thoroughly with a power tiller followed by laddering to level the plots. Irrigation channels were made around the plots. The layouts of the experiment were prepared according to the design of experiment (RBD) with 3 replications. FYM @ 15t ha^{-1} were applied during final land preparation along with recommended doses of fertilizer (N: P: K- 75:60:75 Kg ha^{-1}) applied in two splits doses [½ dose of N, full dose of P_2O_5 and ½ dose of K_2 as basal and rest of the quantity at 25-30 days after planting as top dressing] followed by earthing up and irrigation.Healthy and disease free uniform sizes of tubers of seven varieties of potato (V_1-Kufri Jyoti, V_2-Kufri Himalini, V_3-Kufri Chipsona-3, V_4-Kufri Garima ,V_5-Kufri Chandramukhi, V_6- Kufri Gaurav, V_7-Kufri Pokhraj) were taken as planting materials. Potato varieties were planted at a spacing of 30 x 60 cm on a ridge plot of 3m x 1.2m during second fortnight of November. Initially till 15 days watering was applied with the help of a pipe in the form of spray to maintain optimum soil moisture condition which would help to germinate the tubers. Afterwards each plot was irrigated at 10 days interval till harvest to keep the field soil nearly at field capacity.The experimental plots were kept free from weeds by spading followed by earthing up at 25-30 days after planting. Fungicide "Mancozeb" *e.g.* Dithane M-45, @ 2.5g $liter^{-1}$ of water applied at 12 days interval starting from 3rd week after planting till harvest of the crop to check late blight infection of potato. Bleaching powder @10g $liter^{-1}$ of water was applied as soil drench after 40 days of planting to control bacterial wilt of potato. Five randomly selected plants per plot per replication were recorded on different characters of the plants and tubers like plant height (cm), number of leaves $plant^{-1}$, number of shoots $plant^{-1}$, total fresh weight of plants (g), dry weight of plants (g), fresh weight of tubers (g) $plant^{-1}$, dry weight of tubers g $plant^{-1}$, number of tubers $plant^{-1}$, biomass yield kg $plot^{-1}$ projected biomass yield t ha^{-1}, yield kg $plot^{-1}$ and projected yield of tubers kg ha^{-1}. Net return or profit was calculated by subtracting production cost from the gross values of the produce. Prices used for harvest products were the average prices of two years prevailed during the experimental period. The benefit cost ratio (BCR) was calculated by dividing the net return by the cost of production. The coconut equivalent yield (CEY) of intercrops, system productivity as well as economics for different crops were worked out based on prevailing market price of input (Naveen Kumar *et al.,* 2017).

$$\text{Coconut Equivalent Yield of intercrops} = \frac{\text{Yield of intercrop}\left(\text{Kg ha}^{-1}\right) \times \text{Market price of intercrop}\ \left(\text{`}\ \text{kg}^{-1}\right)}{\text{Market price of coconut}\ \left(\text{Rs`}\right)}$$

$$\text{Productivity}\left(\text{nut ha}^{-1}\right) = \underset{\left(\text{Nuts ha}^{-1}\right)}{\overset{\text{Total system productivity}}{\text{Yield of coconut}}} + \frac{\text{Yield of intercrop}\left(\text{`}\ \text{Kg ha}^{-1}\right) \times \text{Market price of intercrops}\ \left(\text{Rs kg}^{-1}\right)}{\text{Market price of coconut}\ \left(\text{Rs`}\right)}$$

The mean values were calculated and statistical analysis were done by appropriate analysis of variance method (Gomez and Gomez, 1984) and significance of different sources of variations were tested by Fisher and Snedecor's 'F' test at 0.05 probability level. Least significant differences among the levels of the factors along with this interaction effects were worked out using appropriate formula (Gomez and Gomez, 1984) and taking help from the statistical table by Fisher and Yates (1974).

RESULTS AND DISCUSSION

2 years data presented in Table-1 on plant height of potato and number of shoots $plant^{-1}$at 30days interval up to 90 days indicated that among the seven varieties tested so far, at 30 days after planting plant height of all the varieties were almost nearer to each other which ranged between 23.79cm -27.61 cm. Here under the shade of coconut, at 30 days after planting Kufri Himalini recorded mean maximum plant height of 27.97cm and Kufri Chipsona recorded mean minimum height of 23.79cm. Plant height at 60 DAP recorded maximum of 48.86cm in the variety Kufri Himalini followed by Kufri Jyoti (47.59cm) whereas, Kufri Gaurav noted minimum plant height of 32.14cm. The mean value of plant height at 90 DAP was also recorded maximum of 74.53cm in the variety Kufri Himalini followed by Kufri Jyoti (68.02cm) and Kufri Pokhraj

Table 1: Plant height and number of shoots of Potato varieties intercropped in coconut garden under South Bengal

Varieties	Plant height(cm)									Number of shoots plant $^{-1}$								
	30DAP			60DAP			90DAP			30DAP			60DAP			90DAP		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
K. Jyoti	23.70	25.31	24.51	45.73	49.44	47.59	65.75	70.29	68.02	2.85	2.24	2.54	3.07	2.83	2.95	2.53	2.91	2.72
K.Himalini	26.63	29.31	27.97	47.06	50.66	48.86	73.77	75.30	74.53	3.38	2.88	3.13	3.62	3.18	3.40	2.21	2.78	2.49
K.Chipsona	24.53	23.05	23.79	42.29	44.49	43.39	58.64	61.80	60.22	2.59	3.48	3.04	3.42	3.75	3.58	3.34	3.61	3.48
K.Garima	26.61	24.86	25.74	42.56	45.05	43.81	62.92	65.24	64.08	3.64	3.02	3.33	3.73	3.15	3.44	3.11	3.25	3.18
K. CM	27.61	24.36	25.98	32.67	35.11	33.89	48.20	40.93	44.56	3.46	2.51	2.99	3.73	3.18	3.46	2.19	2.44	2.32
K.Gaurav	26.33	21.31	23.82	31.18	33.11	32.14	50.27	44.08	47.17	3.23	3.16	3.20	3.66	3.25	3.46	2.95	3.26	3.10
K.Pokhraj	25.05	23.95	24.50	42.66	46.68	44.67	65.85	68.22	67.04	2.73	2.49	2.61	2.86	2.49	2.68	2.42	2.72	2.57
SEm (±)	**2.13**	**1.39**	**1.33**	**2.69**	**2.62**	**0.42**	**1.65**	**1.89**	**2.37**	**0.39**	**0.24**	**0.30**	**0.19**	**0.18**	**0.16**	**0.04**	**0.11**	**0.07**
LSD (0.05)	**NS**	**4.34**	**NS**	**8.37**	**8.18**	**1.48**	**5.13**	**5.88**	**8.37**	**NS**	**0.75**	**NS**	**0.58**	**0.56**	**0.55**	**0.11**	**0.35**	**0.24**

(V_1-KufriJyoti ,V_2–KufriHimalini ,V_3-Kufri Chipsona-3 ,V_4-KufriGarima ,V_5–KufriChandramukhi ,V_6- Kufri Gaurav,V_7-KufriPokhraj)

Table2: Number of leaves,tubers and length of tubers of Potato varieties intercropped in coconut garden under South Bengal

Varieties	Number of leaves plant^{-1}									No. of tubers plant^{-1}			Length of tubers(cm)		
	30DAP			60DAP			90DAP			At harvest			After harvest		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
K.Jyoti	11.12	11.67	11.40	26.59	28.27	27.43	35.92	33.34	34.63	5.33	6.11	5.72	5.46	5.61	5.54
K Himalini	11.15	11.13	11.14	33.46	33.60	33.53	34.89	36.65	35.77	5.34	4.78	5.06	6.23	6.87	6.55
K Chipsona	9.98	10.40	10.19	41.52	44.73	43.12	46.14	48.00	47.07	6.87	5.89	6.38	4.29	4.86	4.58
K. Garima	10.32	10.87	10.59	36.53	35.20	35.86	41.43	38.56	39.99	6.11	6.89	6.50	6.39	7.16	6.77
K.CM	10.27	10.61	10.44	30.31	25.33	27.82	28.62	29.35	28.98	4.78	4.56	4.67	5.07	5.03	5.05
K.Gaurav	10.46	11.26	10.86	34.89	35.73	35.31	34.11	37.88	35.99	5.22	6.44	5.83	5.32	5.30	5.31
K.Pokhraj	11.34	11.50	11.42	29.48	30.20	29.84	29.53	30.98	30.25	3.89	3.55	3.72	5.91	6.00	5.95
SEm (±)	**0.31**	**0.33**	**0.14**	**1.39**	**3.04**	**1.31**	**1.45**	**2.22**	**1.22**	**0.47**	**0.47**	**0.41**	**0.32**	**0.24**	**0.17**
LSD (0.05)	**NS**	**NS**	**0.48**	**4.338**	**9.46**	**4.61**	**4.50**	**6.91**	**4.31**	**1.47**	**1.45**	**1.45**	**0.99**	**0.76**	**0.60**

(V_1-KufriJyoti ,V_2–KufriHimalini ,V_3-Kufri Chipsona-3 ,V_4-KufriGarima ,V_5–KufriChandramukhi ,V_6- Kufri Gaurav,V_7-KufriPokhraj)

Table 3: Tuber yield parameters of Potato varieties intercropped in coconut garden under South Bengal

Varieties	Diameter of tuber (cm)			Weight of tuber (g)			Fresh weight (g) of tubers plant^{-1}			Dry weight (g) of tubers100g^{-1}		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
K.Jyoti	5.16	4.58	4.87	56.84	63.49	60.17	235.97	295.19	265.58	17.69	18.15	17.92
K.Himalini	4.88	5.09	4.99	52.40	59.18	55.79	226.72	272.89	249.81	19.03	19.74	19.39
K.Chipsona	3.61	4.25	3.93	43.76	45.09	44.43	204.83	190.88	197.86	18.89	17.96	18.43
K.Garima	5.97	5.08	5.53	60.55	68.44	64.49	301.99	352.81	327.40	18.58	19.05	18.82
K.CM ,	4.00	3.62	3.81	48.05	52.97	50.51	131.77	156.07	143.92	17.81	18.86	18.34
K.Gaurav	4.81	4.09	4.45	50.76	50.15	50.46	203.91	220.37	212.14	16.43	15.28	15.86
K.Pokhraj	4.72	4.13	4.42	54.05	61.83	57.94	175.85	215.72	195.78	14.96	16.86	15.91
SEm (±)	**0.29**	**0.21**	**0.28**	**1.36**	**1.53**	**1.67**	**24.82**	**38.18**	**12.53**	**0.74**	**0.72**	**0.54**
LSD (0.05)	**0.90**	**0.651**	**0.97**	**4.23**	**4.78**	**5.89**	**77.29**	**118.96**	**44.21**	**2.30**	**2.25**	**1.90**

Table 4: Projected tuber yield and biomass yield of Potato varieties intercropped in coconut garden under South Bengal

Varieties	Potato						Coconut			Benefit			Cost			Ratio		
Varieties	Potato						Biomass											
	Yield (kg plot^{-1})			Projected yield (t ha^{-1})			Fresh weight of stem (g plant^{-1})			Dry weight g. (100g) of stem plant^{-1}			Biomass yield (g plot^{-1})			Projected Biomass yield (kg ha^{-1})		
	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
K.Jyoti	3.44	3.62	3.53	4.91	5.17	5.04	151.52	169.97	160.75	14.56	14.93	14.75	504.58	601.17	552.87	717.51	854.87	786.19
K.Himalini	5.85	6.26	6.06	8.35	8.94	8.64	106.64	118.29	112.47	11.32	12.91	12.12	247.65	312.85	280.25	352.15	444.87	398.51
K. Chipsona	3.08	3.27	3.18	4.40	4.67	4.54	191.76	221.00	206.38	10.34	9.66	10.00	479.28	508.16	493.72	681.53	722.60	702.07
K.Garima	7.03	7.57	7.30	9.99	10.76	10.38	221.71	241.67	231.69	11.20	10.09	10.65	623.34	589.12	606.23	886.39	837.73	862.06
K.CM	2.90	3.16	3.03	4.14	4.51	4.32	122.18	135.99	129.09	9.70	11.61	10.66	253.84	348.41	301.12	360.96	495.43	428.20
K.Gaurav	4.55	4.72	4.64	6.49	6.74	6.62	125.15	143.00	134.08	9.27	8.65	8.96	251.59	278.69	265.14	357.76	396.29	377.02
K.Pokhraj	5.12	5.72	5.42	7.30	8.16	7.73	147.63	165.67	156.65	12.90	12.28	12.59	433.74	481.96	457.85	616.78	685.35	651.06
SEm (±)	**0.25**	**0.33**	**0.09**	**0.39**	**0.49**	**0.13**	**13.63**	**16.36**	**2.79**	**0.79**	**0.78**	**0.61**	**39.90**	**37.77**	**22.71**	**56.74**	**53.71**	**32.29**
LSD (0.05)	**0.78**	**1.03**	**0.32**	**1.22**	**1.53**	**0.45**	**42.46**	**50.97**	**9.85**	**2.46**	**2.43**	**2.12**	**124.30**	**117.67**	**80.10**	**176.75**	**167.32**	**113.91**

Table 5: Economics of potato production under coconut based cropping system under South Bengal

	Projected yield (t ha^{-1})			Gross return (Rsha^{-1})		Yield (No.ha^{-1})	Gross return (Rs.)	System productivity (CEY + nut yield)	Cost of production (C +P)	Gross return (C+P)	Net profit (C+ P)	B:C ratio
	2019	2020	Mean	Mean	CEY	Mean	Mean		Mean	Mean	Mean	Mean
K. Jyoti	4.91	5.17	5.04	60480	4320	15225.00	213150	19545.00	127276	273630	146354	1.15
K. Himalini	8.35	8.94	8.65	103740	7410	15137.50	211925	22547.50	127276	315665	188389	1.48
K. Chipsona-3	4.40	4.67	4.54	54480	3891	15312.50	214375	19203.50	127276	268849	141573	1.11
K. Garima	9.99	10.76	10.38	124560	8897	15225.00	213150	24122.00	127276	337708	210432	1.65
K.CM	4.14	4.51	4.33	51900	3707	15312.50	214375	19019.50	127276	266273	138997	1.09
K.Gaurav	6.49	6.74	6.62	79380	5670	15137.50	211925	20807.50	127276	291305	164029	1.29
K.Pookhraj	7.30	8.16	7.73	92760	6626	15225.00	213150	21851.00	127276	305914	178638	1.40

Potato (P) @ Rs.12kg^{-1}, Coconut (C) @ Rs 14nut^{-1}, CEY - Coconut equivalent yield

(67.04cm) and Kufri Chandramukhi recorded mean minimum plant height of 44.56 cm. The number of shoots plant^{-1} indicated that within the period of 30 to 90 DAP no huge variation among the varieties tested so far. At 30 DAP mean maximum number of shoots of 3.33 per plant was recorded in the variety KufriGarima followed by Kufri Gaurav (3.20) and Kufri Jyoti recorded mean minimum of 2.64 numbers of shoots per plant . At 60 DAP mean maximum (3.58) number of shoots was recorded in the variety Kufri Chipsona-3 and Kufri Chandramukhi recorded minimum of 2.32 numbers per plant. At 90 DAP mean maximum number of shoots per plant (3.48) was found in the variety Kufri Chipsona-3 followed by Kufri Garima (3.18) and Kufri Gaurav (3.10) and Kufri Chandramukhi recorded mean minimum (2.32) number of shoots per plant (Table-1).

Table-2 representing the number of leaves per plant indicated that at 30 DAP mean number of leaves recorded per plant were almost similar which ranges between 10.19 to 11.42 numbers per plant out of which Kufri Pokhraj recorded maximum of 11.42 number of leaves per plant followed by Kufri Jyoti (11.40) and Kufri Chipsona-3 recorded minimum of 10.19 number of leaves per plant. But at 60 DAP, number of leaves recorded maximum (43.12) in the variety Kufri Chipsona-3 and minimum 27.43 numbers in the variety Kufri Jyoti. Even at 90 DAP, number of leaves were recorded maximum (47.07) in the variety Kufri Chipsona-3 and minimum were recorded in the variety Kufri Chandramukhi (28.98). From the data presented in Table-2 on no of tubers plant^{-1} and tuber length it is clear that Kufri Garima recorded mean maximum (6.50) numbers of tubers per plant followed by Kufri Chipsona-3 (6.38) and variety Kufri Pokhraj recorded minimum of 3.72 number of tubers plant^{-1} at maturity under coconut plantation. The mean maximum tuber length (6.77 cm) was noted under the varietyKufri Garima and lowest inKufri Chipsona-3 (4.58 cm).

Data presented in Table-3 on diameter of tubers(cm), weight of tubers(g), fresh weight of tubers g plant^{-1} and dry weight of tubers g100g^{-1}indicated that mean maximum tuber diameter of 5.53 cm was registered in the variety Kufri Garima and minimum in Kufri Chandramukhi (3.81cm). The mean weight of tubers was also recorded maximum in the variety Kufri Garima (64.49g) followed by Kufri Jyoti (60.17g) and minimum of 44.43g was recorded in Kufri Chipsona-3. Fresh weight of tubers per plant was recorded maximum in Kufri Garima (327.40 g) and lowest in Kufri Chandramukhi (143.92 g). The mean dry weight of tubers 100g^{-1} was recorded highest (19.39g) in Kufri Himalini and lowest in Kufri Pokhraj (15.91 g).

It is clear from Table-4 that per plot maximum tuber yield of 7.30kg was recorded by the variety Kufri

Garima followed by Kufri Himalini (6.06kg) and Kufri Chandramukhi recorded mean minimum tuber yield of 3.03 kg plot^{-1} under the shade of coconut. The projected yield of potato recorded maximum (10.38 t ha^{-1} available land) in Kufri Garima followed by Kufri Himalini (8.64 t ha^{-1} available land) and Kufri Chandramukhi recorded minimum yield of 4.32 tons ha^{-1} available land. The fresh weight of stems presented in Table-4 indicated that mean fresh stem weight was recorded maximum of 231.69 g plant^{-1} in the variety Kufri Garima followed by Kufri Chipsina-3 (206.38 g plant^{-1}) and Kufri Himalini recorded mean minimum stem weight of 112.47 g plant^{-1}. In case of dry weight of stem per100 g fresh weight, it is clear from the average data presented in Table-4, that maximum dry weight of 14.75g per 100 g fresh weight of stem was recorded in the variety Kufri Jyoti followed by Kufri Pokhraj (12.59g) whereas Kufri Gaurav recorded minimum of 8.96g per 100 g fresh weight of plants. The maximum projected biomass available per hectare (862.06 kg ha^{-1} available land) was recorded from the variety Kufri Garima and minimum in Kufri Gaurav (377.02 kg ha^{-1} available land).

Table 5 clearly indicated that out of 7 varieties of potato grown under the shade of coconut plantation as coconut based cropping system model, variety Kufri Garima recorded maximum tuber yield of 10.38 t ha^{-1} available land followed by Kufri Himalini (8.65t ha^{-1} available land) whereas minimum tuber yield of 4.33t ha^{-1} available land was recorded in the variety Kufri Chandramukhi followed by Kufri Chipsona (4.54t ha^{-1} available land). Accordingly highest coconut equivalent yield of 8897 numbers and highest system productivity of 24122 numbers of coconuts were also recorded in Kufri Garima followed by Kufri Himalini (7410 and 22547.5 numbers respectively). From the above table, it is clear that under the shade of coconut plantation potato can be grown and out of seven varieties, Kufri Garima recorded maximum B: C ratio of 1.65 with a net return of Rs.210432 ha $^{-1}$ available land followed by Kufri Himalini (B: C ratio 1.48, net return of Rs 188389 ha^{-1} available land respectively).

Two years mean coconut equivalent yield of different varieties of potato grown as intercrop in coconut garden (Table-5) showed a significant difference among the cropping sequences. Coconut+KufriGarima cropping sequence recorded highest coconut equivalent yield of 8897 nuts ha^{-1}and system productivity of 24034.5 nuts ha^{-1} followed by Coconut + Kufri Himalini (7410 nuts ha^{-1} and 22547.5nuts ha^{-1}) respectively. Due to relatively better performance of a particular variety of companion crops and better market prices for their produce, higher coconut equivalent yield and higher system productivity in above intercropping systems was attributed highest tuber yield in tapioca followed by yam and elephant foot yam under the shade of coconut plantation which were grown as rainfed crop around the base of the palms leaving an area of 2m radius (Naveen Kumar et al. 2017). They also reported that growing of all the three tuber crops as intercrops were found to be profitable, but tapioca gave the maximum profit. Inter cropping with tapioca gave about 50% more income compared to the other tuber crops which indicates that intercropping was more profitable than mono cropping of coconut. They also revealed that coconut and tapioca variety H-165 gave the highest net return of Rs 7415 ha^{-1} followed by coconut and elephant foot yam (Rs5890 ha^{-1}) and coconut and yam (Rs 5650 ha^{-1}) while coconut alone gave only Rs2520 ha^{-1}. Coconut + tapioca combination gave the highest net return per rupee invested (1:1.47), followed by coconut+ elephant foot yam (1:1.16) and coconut+ yam (1:1.08) whereas mono cropping gave the ratio of 1:0.90.

CONCLUSION

From the above investigation it can be concluded that potato can be grown successfully under the partial shade of coconut and out of seven varieties tested so far variety Kufri Garima is found promising in terms of highest B: C ratio of 1.65 and net return of Rs.210432 ha^{-1} available land, followed by Kufri Himalini (1.48, Rs.188389 ha^{-1} respectively) and may be recommended for South Bengal to grow under the partial shade of coconut.

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