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Cashew (*Anacardium occidentale*) cultivation by smallholders in northern dry zone of Karnataka: an analysis of practices, impact, determinants and constraints

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ABSTRACT

The study measured cashew (Anacardium occidentale L.) cultivation practices, its impact and determinates and constraints faced by farmers in the Northern Dry Zone of Karnataka.An 'ex-post-facto cause to effect' design was used and findings indicated that the majority cashew farmers derived moderate socio-economic benefits, particularly with high social benefits in comparison to low economic benefits. Medium levels of social participation, extension participation, mass media exposure and opinion leadership were measured among the majority of the farmers practicing cashew cultivation. Impact on cropping pattern, labour engagement and farm expenditure were found to be low while an increase in family incomes and expenditure were reported. The regression analysis revealed that four personal variables, viz. cashew farmer type of family, land used for cashew, and one economic variable, i.e., cultivable land available in acres as exerting a significant positive contribution towards explaining the variability in socio-economic impact. The variables used in the study could together explain up to 67% variability in socio-economic impact. The stepwise regression model developed to predict socio-economic impact explained up to 83% of the variation in socioeconomic impact using the predictors; importance given to cashew, years of experience in farming, cosmopoliteness, extension participation, land used for other crops and net income from cashew farming. The study also faced challenges such as recall bias among respondents and limited accessibility to remote cashew-growing areas. The study revealed major constraints faced by farmers like poor price quoted by traders and the price fluctuations for raw cashew nut, scarcity of hired labourers, incidence of tea mosquito bug owing to crop loss and death of yielding trees due to cashew stem and root borer attack.

Keywords: *Cashew farmers, Constraints, Determinants, Socio-economic impact, Regression analysis, Price fluctuation, Yield loss.*

INTRODUCTION

Cashew (*Anacardium occidentale*L.) belongs to the family Anacardiaceae is one of the important plantation crops of the country earning valuable foreign exchange. In Karnataka, cashew cultivation mostly confined to coastal regions, but it gained popularity in hills and plains because of its drought tolerance and wider adaptability to various agroclimatic conditions [26]. Successful cashew cultivation, however, depends on the selection of the best varieties suited for the agroclimatic condition and adoption of right package of practices recommended for the region.

Cashew (*Anacardium occidentale* L.) is a tropical plant that belongs to the family Anacardiaceae found within the region between 230 N and 230 S of the equator. It gained popularity in hills and undulated land because of its drought tolerance and wide adaptability to various agro-climatic conditions [8] cashew crop can be grown successfully in areas with annual rainfall of 50-350 cm. Being an ever-green tree of tropics this is cultivated in more than 52 countries in the tropical region for its delightful, nutritious kernels, apple, and cashew nut shell liquid (CNSL). The Portuguese traders introduced the cashew tree in to India and Africa to prevent soil erosion. India is the first country in the world to exploit the international trade in cashew kernels in the early part of 20th century [9]. Value-added products such as juice, Fenni, wine, dried cashew apple, syrup and jam can be prepared from cashew apple. Cashew nut shell liquid, a byproduct of nut is also treated as a valuable raw material for paints and varnish industries [9]. India has exported 13,222 metric tonnes of cashew nut shell liquid in the year 2023-24 with the total value of Rs.77.22 cr.[5]. The current Cashew nut production in India accounts for 23 per cent of the global production. It is being grown in Kerala, Karnataka, Goa, and Maharashtra along the West coast and Tamil Nadu, Andhra Pradesh, Odissa and West Bengal along the East- coast, occupies an area of 12.00 lakh hectares in the country with a production of 7.92 lakh metric tonnes [5].

Karnataka is a prominent state in cashew production, occupying 5th position in area (1, 18, 000 ha) ranking 6th in production (53,000 MT) with an average productivity of 461 kg/ha which is much less than the national average. Dakshina Kannada district has the highest area of cashew in Karnataka, followed by Udupi, Belgaum, Chikkaballapur, Uttara Kannada, Kodagu and Kolar [18]. Selection of varieties is most important and critical decision in plantation management [22]. Hence, the present investigation was undertaken to assess the cashew cultivation, its impact and determinants and constraints faced by farmers in Northern Dry Zone of Karnataka.

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METHODOLOGY

1.Location of the study: Vijayanagar, Bellary and Koppalare the districts of Northern Karnataka. It receives low to moderate rain fall was selected as the locale of the study area. Average rainfall ranges from 635 mm and in general, soil types are black and red soil.

2. Sampling design:

The study was conducted during 2022-25 by Agricultural Extension Education Centre, Huvinahadagali as part of the project 'Popularization of cashew cultivation in non-traditional area. Purposive sampling technique was used to select Vijayanagara, Koppal and Bellary district of Kalyana Karnataka Region.

Popularization of Cashew cultivation in non-traditional area scheme was given by Directorate of Cashew and Cocoa Development, Kochi, Kerala, Ministry of Agriculture and Farmers Welfare and which was implemented through Agricultural Extension Education Centre, Huvinahadagali, with an objective to establish model cashew plots of cashew in non-traditional areas. To educate, train, and demonstrate different techniques of soil and moisture conservation practices in cashew, to create awareness among farmers that cashew can be profitably cultivated in non-traditional areas and to educate the farmers on other important aspects in cashew cultivation such as training and pruning of plants, plant protection, critical irrigation (for first 3 years), possibilities of growing intercrops etc.

The Agricultural Extension Education Centre, Huvinahadagali, promoted cashew cultivation in non-traditional areas of Vijayanagara, Bellary, and Koppal districts of Karnataka and provided frontline demonstrations from 2018 to 2025 during the Kharif season. Before executing the FLDs, discussions with farmers, surveys, and visits were conducted to select farmers and villages, and then an orientation training programme on cashew cultivation and production technologies was provided to the beneficiaries, relevant to the crop under demonstration. Over the course of five years, 576 hectares of land were planted with cashew Vengurle varieties. The selected farmers were given Cashew soft grafts under FLDs. Frequent monitoring was carried out during the FLDs from pit preparation to planting to ensure that the acceptable package of practices, including timely planting, efficient plant protection, and weed management.

A detailed pre-tested interview schedule was administeredto 50 randomly selected respondents.A structured interview schedule was developed to measure the socio- personal and economic profile of farmers. The schedule contained 120 questions and took about 40 minutes to elicit information from one household. The questionnaire was pre-tested on a small group and found the reliability for tool was 0.75 (Cronbach's alpha) and the Guttmann split-half co-efficient was 0.72. Based on the results,the schedule was structured, sharpened and standardized.The data were collected during 2022-2025 through a questionnaire and personal interviews. Data was analysed using Microsoft Excel 2007 and IBMSPSS Statistics Ver. 26. Overall adoption index for the farmer was calculated as mean of sum of adoption scores obtained for all the seven major technology components measured.

RESULTS

1. Personal profile of cashew farmers

The fourteen personal variables were studied and are furnished in Table 1.

It can be noted that the majority of the cashew farmers were in middle age category with mean ageof 45 years. Majority were primary and secondary school pass (46%), majority (36%) belonged to high socioeconomic category while84% had agriculture itself as their primary occupation.Most farmers (60%) had medium level of experience in farming with an average experience of 16.5 years inagriculture. These results concur with those of Venkatkumar [31] [32] [33] [13] [25] [28]. The majority (41%) had only an average of 10.5 years of cashew farming experience. Contradictory findings were reported by [28]. Contact with extension agencies was found to be medium among the majority of cashew farmers (64%) while participation inextension programmes was found to be medium for almosttwo-third of the farmers (74%). Similar findings reported by [19] [25]. Majority of the cashew farmers (46%) exhibited low levels of ICT usage, whereas in case ofCosmo politeness, majority were into high and medium categories (36%). These findings contradict previous ones by [11] [25] [31]. While 44% of cashew farmers provided irrigation to the cashew crops, 64% planted cashew only through rainfed systems.

Table 1: Socio-personal profile of cashew farmers (n=50)

Variables	Category	Frequency	Percent
Age	Young	7	14.00
	Middle age	37	74.00
	Old	6	12.00
Locality	Rural	39	78.00
	Urban	11	22.00
Type of family	Joint	20	40.00
	Nuclear	30	60.00
Education of the participant	Illiterate	5	10.00
	Primary & Secondary	3	6.00
	PUC	19	38.00
	Graduation and above	23	46.00
Socioeconomic status of the family	High	18	36.00
	Middle	17	34.00
	Poor	15	30.00
Primary occupation	Agriculture	42	84.00
	Others	8	16.00
Experience in farming in years	Low (<10)	9	18.00
	Medium (11-20)	30	60.00
	High (>20)	11	22.00
Land used for cashew	Fully irrigated	14	28.00
	Partially irrigated	32	64.00
	Rainfed	4	8.00
Land used for other crops	Fully irrigated	22	44.00
	Partially irrigated	17	34.00
	Rainfed	11	22.00
Experience in cashew farming in years	<6	28	56.00
	6-12	17	34.00
	>12	5	10.00
Extension contacts	Low	10	20.00
	Medium	32	64.00
	High	8	16.00
Extension participation	Low	7	14.00
	Medium	37	74.00
	High	6	12.00
ICT usage	Low	23	46.00
	Medium	21	42.00
	High	6	12.00
Cosmo politeness	Low	2	4.00
	Medium	26	52.00
	High	22	44.00

2.Economic profile of cashew farmers

The economic profile of cashew farmers is presented inTable 2. Majority of the farmers(58%) grew 2-4 crops on an average in their farms while almost three-fourth of them (52%) gave least priority tocashew farming. These findings are in agreement with that of [32]. The average farm size was found to be 2.5 acres. Majorityhad nil or negligible amount of unused land available for cultivation.

The study showed that households had an averagenumber of 200 cashew trees with a mean yield of 2.32 kg/tree. Majority of the cashew farmers (46%) realizedonly moderate yields with an average net income of 45,000/ha/year against an average expenditure of 5,000/ha/year.

Table 2: Economic profile of cashew farmers (n=50)

Variables	Category	Frequency	Percent
No. of crops grown per year	<2	29	58.00
	2-4	17	34.00
	>4	4	8.00
Farm size in acres	<2.5 ha	7	14.00
	2.5-5 ha	37	74.00
	>5 ha	6	12.00
Cultivable land available in acres	<1	27	54.00
	3-4	12	24.00
	>4	11	22.00
Yielding cashew tree (No's)	<80	37	74.00
	81-200	9	18.00
	>200	4	8.00
Yield of cashew per tree in kgs	>3.96	21	42.00
	3.96-1.87	23	46.00
	<1.87	6	12.00
Expenditure in cashew farming in Rs. Per acre	<3780	20	40.00
	3780-14806	23	46.00
	>14806	7	14.00
Net income from cashew farming in Rs.	Low	18	36.00
	Medium	24	48.00
	High	8	16.00

3.Socio-economic impact of cashew cultivation

Nine major social and economic impact indicators were studied to arrive at the socio-economic impact of cashew farming among the respondents (Table 3). Study on the impact on cropping pattern didn't indicate much of change with only 13% of farmers increasing area under cashew over the years. Impact on labour engagement was also high with only 62% farmers hiring labour for cashew and 42% of them opting for increased family labour engagement. Labor hire was observed, notably for plant protection and harvesting operations, with farmers typically employing one to two labourers during fruiting time.While a large majority (56%) reported no change in farm expenditure due to cashew cultivation, 56% of farmersreported an increase in farm income due to cashew cultivation. Farmers reported an average increase of 2572/year in farm expenditure and 45,000/year in farm incomedue to cashew cultivation. [20] revealed low productivity of cashew farms in the region, as well as significant price swings in the raw cashew nut market, resulting in limited economic benefits. However, previous research in neighbouring states such as Kerala and Maharashtra found that cashew producers had a higher economic impact [31] [28].

Table 3: Socioeconomic impact of cashew cultivation (n=50)

Impact Indicators		Increased		No change	
		Frequency	Percent	Frequency	Percent
Impact on cropping pattern	Area under cashew cultivation over the years	37	74.00	13	26.00
Impact on labour engagement	Hired labour for cashew cultivation	31	62.00	19	38.00
	Family labour cashew cultivation	21	42.00	29	58.00
Impact on farm expenditure	Cashew cultivation and farm expenditure	28	56.00	22	44.00
Impact on farm income	Cashew cultivation and farm income	34	68.00	16	32.00
Impact on family expenditure	Profit from cashew cultivation and family expenses	22	44.00	28	56.00
Impact on social participation	Cashew cultivation and participation in social events	26	52.00	24	48.00
Impact on extension contact	Contacts with extension agency and research institutes	28	56.00	22	44.00
Impact on mass media exposure	Cashew cultivation and mass media exposure	27	54.00	23	46.00
Impact on opinion leadership	Cashew cultivation and opinion leadership in his/her area	22	44.00	28	56.00

*For last 10 years of cashew cultivation for those respondents who reported an increase in indicators

Analysis of social impact presented a better picture incomparison to economic impact with majority (52%) of thefarmers reporting increased social participation while more than half of the farmers could increase their contacts with extension agencies and research institutes due to cashew cultivation. Majority (54%) reported increase in their massmedia exposure while a large majority (44%) reported anincrease in their opinion leadership status due to cashew cultivation. [31] [32] showed similar levels of social impact among cashew producers in Kerala and Maharashtra. It is apparent that the social benefits of cashew production considerably outweigh the economic benefits.

4.Determinants of socio-economic impact

Correlation and regression analysis were employed to ascertain the relationship between impact and socioeconomic variables and their contribution in explaining the variability in impact respectively. The results are presented separately for socio-personal variables and economic variables in Tables 5 and 6.

4.Relationship and contribution of personal variables towards Socio-economic impact (n=50)

Variables	'r' value
Age	.123
Locality	.478**
Type of family	.677
Education of the participant	.068
Socioeconomic status of the family	.641
Primary occupation	.117
Experience in farming in years	.192
Land used for cashew	.295**
Land used for other crops	.169
Experience in cashew farming in years	.234
Extension contacts	.368
Extension participation	.723
ICT usage	.618
Cosmo politeness	.147

**** Significant at 1% level, ** Significantat 5% level, * Significant at 10% level*

6.Relationship and contribution of personal variables towards socio-economic impact

The correlation analysis identified that three personal variables, *viz.* years of experience in farming, extension participation and Cosmo politeness of cashew farmers had a significant relationship with socio-economic impact. The regression analysis revealed that four variables, *viz*. the age of cashew farmer, locality, years of experience in farming and Cosmo politeness had a significant positive contribution towards socio-economic impact (Table 5).

Table 5: Relationship and contribution of economic variables towards socio-economic impact (n=50)

Variables	'r' value
No. of crops grown per year	.595
Farm size in acres	.073
Cultivable land available in acres	.831**
Yielding cashew tree (No's)	.135
Yield of cashew per tree in kgs	.114
Expenditure in cashew farming in Rs. Per acre	.256
Net income from cashew farming in Rs.	.215

**** Significant at 1% level, ** Significantat 5% level, * Significant at 10% level*

7.Relationship and contribution of economic variables towards socio-economic impact

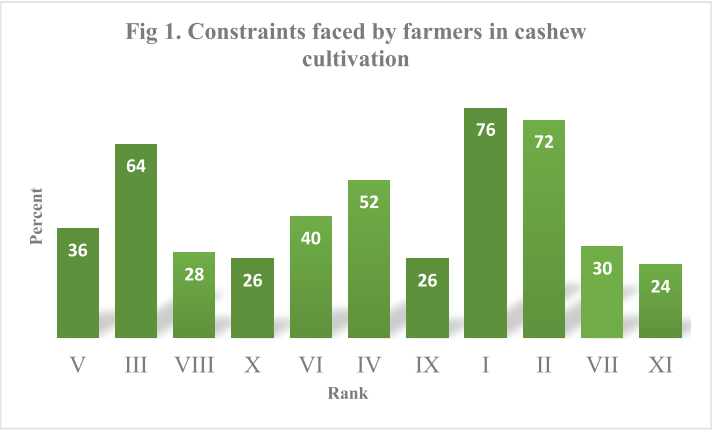
The study identified seven economic variables, *viz* importance given to cashew, cultivable available land, number of yielding cashew trees, and expenditure in cashew farming as having significant relationship with socio-economic impact. The regression analysis reveals that one variable, i.e. importance given to cashew exerts a significant positive contribution towards explaining the variability in socio economic impact (Table 6).

8.Constraints faced by farmers in cashew cultivation

The socio-economic impact of cashew cultivation is largely influenced by the constraints faced by farmers. The present study revealed 12 constraints as reported by farmers and are classified under technical, management, economic/marketing and processing constraints (Table 8). Majority(83%) reported wide price fluctuations in the market for raw cashew nut as the major constraint (Rank 1). Lack of cashewfarmer associations/groups and availability of cashew nutsfrom African nations allow cashewnut processors to manipulate the raw cashewnut prices. Scarcity of labour was the second biggest constraint reported (71%).Migration of workforce to urban areas, easy job availabilitythrough MNREGA scheme and respectable job avenues inmany private firms for women have acted as reasons for the lowavailability of workforce in villages.

Table 6: Constraints faced by farmers in cashew cultivation

Constraints	Rank	Frequency	Percent
Technical constraints			
Attack of tea mosquito bug and resultant yield loss	V	18	36.00
Stem and root borer and death of cashew yielding trees	III	32	64.00
Flower drying	VIII	14	28.00
Poor yield	X	13	26.00
Poor soils in cashew orchards	VI	20	40.00
Management constraints			
Collection of nuts from large plantations/theft	IV	26	52.00
Monkey menace during fruiting	IX	13	26.00
Economic/Marketing constraints			
Poor price/ price fluctuation	I	38	76.00
Non- availability of labour	II	36	72.00
Lack of cashew farmer associations/groups	VII	15	30.00
Processing constraints			
No value for cashew apple/wastage of cashew apple	XI	12	24.00



Attack of tea mosquito bug and resultant crop loss (41%) and death of yielding trees due to cashew stem and root borer attack (35%) were also major constraints (Rank 3 and 4). This is a matter of concern since cashew yields are largely influenced by the attack of tea mosquito bug (TMB) while attack of the cashew stem and root borer (CSRB) eliminates the crop itself. These findings are in agreement with [7] [32] [12]. Flower drying (Rank 5) and poor yield in some varieties(Rank 6) like NRCC selection-2 (flower drying), VRI-3, VTable 4 and V-7 (poor yield) were also major constraints. Problemsin collection of nuts from large plantations and the resultant theft due to delay or inaccessibility was another constraint reported by farmers. Similar constraints were reported by [22] [17] [15] [28]. Price control and manipulation by cashewprocessors were also identified as a constraint by certainsection of farmers. Cultivation of cashew in poor soils andwastage of cashew apple due to lack of processing avenueswere the other constraints cited by farmers.

CONCLUSION

The present study concludes that while the majority of cashew farmers have experienced moderate socio-economic benefits from cashew cultivation, the social benefits have outweighed the economic gains. This disparity is a cause for concern, as economic returns play a crucial role in influencing farmers' decisions to continue adopting cashew production technologies or shift to more remunerative crops. The study highlights key constraints faced by cashew farmers, notably the need for government intervention in cashew price stabilization and the establishment of cashew farmers' associations to strengthen collective bargaining power. Additionally, major pest issues such as the tea mosquito bug (TMB) and cashew stem and root borer (CSRB) remain significant challenges. However, these can be effectively managed through timely and preventive control measures. The findings underscore the importance of targeted efforts by research and development agencies to enhance the overall socio-economic impact of cashew cultivation, ensuring it remains a sustainable and profitable option for farmers.

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