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A study on integrated crop management in cashew for sustainable livelihood of tribal farmers in west Godavari district of Andhra Pradesh

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Abstract

Cashew (*Anacardium occidentale* L.) is one of the important cash crops in the study region and has a potential for provide source of livelihood as it has adaptability to varied agro-climatic conditions. Krishi Vigyan Kendra (KVK), Venkataramannagudem (VR Gudem) is working in 25 up land mandals of the west Godavari District including seven tribal mandals to conduct location specific technology demonstrations and trainings for the farming community. During the preliminary visits and survey in tribal villages, it was identified that, cashew as one of the major horticultural crop that provides livelihood to tribal families. But these cashew orchards in tribal villages are neglected, without any management practice. To overcome this situation KVK, VR Gudem conducted two training program meson canopy and seasonal management of cashew orchards and also conducted 200 demonstrations on Integrated Crop Management, including INM practices to improve the soil fertility status. Twenty cashew orchards in Kamaiahkunta cluster were selected for collection of soil samples in grid method and analyzed for both macro and micro nutrients. Based on the soil test results fertilizer application was recommended. Yields in cashew orchards in soils with low nitrogen, medium potash, low available calcium and deficient in zinc could also be managed by application of farm yard manure and micro nutrients along with recommended dose of fertilizers. After KVK intervention the income levels of cashew farmers were tripled with 50% additional increase in cost of cultivation. Further, the cashew farmers in this area are encouraged to register a FPPO with 300 farmers with the collective support of NABARD, ITDA, Department of Horticulture, KVK and NGOs working in the district.

Keywords: Integrated Crop Management, Capacity Building, Collective marketing, Demonstration and Cost of Cultivation

Introduction

Cashew (*Anacardium occidentale* L.) is one of the important cash crops in the study region and has a potential for provide source of livelihood as it has adaptability to varied agro-climatic conditions. It is considered as crop with high economic and commercial importance in this region.

India stands highest in cashew production in the world as well as in Asia, accounting for 39.47 per cent of world's production. Major cashew producing states in the country are Maharashtra, Kerala, Andhra Pradesh, Orissa, Karnataka and Tamil Nadu, Goa and West Bengal (*Senthil and Mahesh*, 2013). The coastal districts of Andhra Pradesh i.e. East Godavari, West Godavari, Srikakulam, Vizianagaram, Visakhapatnam, Guntur and Prakasam districts are main cashew producers. Andhra Pradesh stands first with 1, 24, 876 Ha. of area and third in terms of production with 1,05, 324 MT. (Patil, 2010).

In West Godavari cashew is one of the major plantation crops grown with an area of about 23, 379 ha with total production of 11689.5 tonnes. In the district KVK, Venkataramannagudem is working in 25 upland mandals including 7 tribal mandals i.e. Buttiahgudem, Polavaram, Jeelugumilli, Velerupadu, Kukunuru, T. Narasapuram, Lingapalem. In the district, KVK, Venkataramannagudem is working in 25 upland mandals including 7 tribal mandals i.e. Buttiahgudem, Polavaram, Jeelugumilli, Velerupadu, Kukunuru, T. Narasapuram, Lingapalem where cashew is the major crop. But the productivity is recorded as only 0.5 T/ha. Which is far below the highest productivity i.e. 2.9 T/ha recorded in Gujarat (Haribabu and Prasanna, 2015). Fifty percent of the cashew area is in tribal mandals and hence considered as the main horticultural crop that provides livelihood to tribal families. But these cashew orchards in tribal villages are neglected, without any management except waiting for good flower and fruit set during the season and collection of nuts at the end of the season.

During the survey it was observed that the problem of low productivity is still persisting. The reasons enlisted to this situation are i) Majority area occupied with seedling raised plantations ii) grown in soils with poor fertility status iii) Less or no nutrient management iv) Loss of yielding trees due to cashew shoot and root borer (CSRB) incidence and v) Infestation with tea mosquito bug

Methodology

Krishi Vigyan Kendra, Venkataramannagudem, West Godavari district of Andhra Pradesh is working in 25 up land

mandals of the district including seven tribal mandals to conduct location specific technology demonstrations and training to augment productivity enhancement in major crops and crop-based enterprises. During its preliminary visits and survey in tribal villages, it was identified that the management of these cashew orchards by conducting trainings and demonstrations in canopy management, nutrient management and integrated pest and disease management can improve the productivity and it can be a source of sustainable livelihood to the tribal families. Accordingly, during 2015-16 the following trainings and demonstrations were conducted.

Table 1: Details of Extension activities conducted in cashew for the year 2015-16

Programme	Activity	No. of Farmers	Villages covered
Canopy & Nutrient management	Training	53	Kamaiahkunta, Bandarlagudem & Pandugudem
Seasonal management of Cashew orchard	Training	110	Jeelugumilli, Datlavarigudem, Vankavarigudem & Tabbisavarigudem
INM in Cashew	Demonstration	20	Kamaiahkunta, Bandarlagudem & Pandugudem
Integrated Pest and Disease Management	Demonstration	200	14 villages in Jeelugumilli & Buttaigudemmandals

After preliminary training on canopy management in cashew for increased productivity twenty cashew orchards were selected in the villages viz., Kamaiahkunta, Bandarlagudem and Pandugudem of Buttaiahgudemmandal to collect soil samples by following grid method (10 ac. as one block). Soil samples from these 20 fields were analyzed to suggest nutrient application. The soil test results of the farmers are given in table no.4. Soil health card generated and distributed to the farmers

Results and Discussion

The twenty soil test results indicated that the soil pH ranged

from 5.02 to 7.78 but the majority indicated that the soils are moderately acidic in nature. The general notion is that cashew is very modest in its soil requirements and can adapt itself to varying soil conditions without impairing productivity. Electrical conductivity (EC) ranged from 0.05 to 0.18, it indicated that the soil condition is good. Available Phosphorous and Potassium is medium. Available Nitrogen and Calcium is low. Available Magnesium and Iron is in sufficient quantities, but the available Zinc was in deficient state. In detailed soil sample analysis results in twenty cashew orchards were given in Table 2.

Table 2: Soil Parameters in cashew orchards in Kamaiahkunta cluster

S. No	Element	Average results	Units	Rating as per soil health indicators
1	Potential of hydrogen	5.956	P.H	Moderately Acidic
2	Electrical conductivity	0.1245	D.C.M	Normal soil
4	Available nitrogen	102.11	Kg/acre	Low
5	Available phosphorus	37.86	Kg/acre	Medium
6	Available potassium	179.90	Kg/acre	Medium
7	Available calcium	0.388	Kg/acre	Low
8	Available Zinc	0.25	Ppm	Deficient
9	Available Magnesium	9.996	Ppm	Sufficient
10	Available Iron	6.071	ppm	sufficient

Fertilizer dose was recommended as application of 10-15 kg of farmyard manure and 500g N (1.1 kg urea), 125g P₂O₅ (625g rock phosphate) and 125g K₂O (208g Murate of Potash) per tree. The results showed that cashew responds well to increased N application both organic and inorganic and application of straight fertilizers is recommended. Fertilizer is applied at the end of the rainy season into a shallow trench at the plant base away from the base (as per the canopy of the tree).

Table 3: Recommended Doses of NPK Fertilizer for Cashew (g/plant)

Year	Urea (gm)	SSP (gm)	Murate of Potash
1	375	275	75
2	750	525	150
3 onwards	1,100	750	200

(Source: <http://agricoop.nic.in/>)

Table 4: Details of Soil sample analysis results in twenty cashew orchards

S. No.	Name of the farmer	Village	Macro nutrient					Micro Nutrient			
			N	P	K	pH	EC	Zn	Mg	Ca	Iron
1	KottamGangadevi	Pandugudem	101.5	42.3	200.5	6.09	0.18	0.21	9.56	0.42	4.11
2	KavamKannaiah	Pandugudem	99.7	37.5	195.67	5.89	0.07	0.21	1.60	0.10	9.75
3	KottamMohanrao	Pandugudem	99.2	38.2	217.21	6.33	0.16	0.32	12.73	0.36	10.1
4	MadakamBhuchuraju	Pandugudem	90.0	32.5	333.96	5.04	0.22	0.17	28.13	0.56	3.57
5	ChintamPentamma	Pandugudem	85.2	35.5	96.5	5.59	0.05	0.27	4.90	0.20	6.21
6	TellamDevaraju	Bandarlagudem	89.7	37.5	323.68	6.32	0.28	0.27	3.60	0.28	2.07
7	PedakamBapiraju	Bandarlagudem	90.7	39.5	141.22	5.02	0.15	0.19	0.61	0.29	1.34
8	MuthamKodavamma	Bandarlagudem	102.5	38.0	152.80	7.78	0.40	0.22	1.71	0.34	1.36
9	TellamDurgarao	Bandarlagudem	92.5	37.5	86.82	5.67	0.05	0.23	10.36	0.22	6.27
10	PottodiChinna Bulli Venkanna	Bandarlagudem	99.7	37.5	336.24	5.04	0.15	0.22	22.37	0.60	4.69
11	MadiviBhimaraju	Kamaiahkunta	105.0	40.5	88.45	5.84	0.08	0.19	9.99	0.44	4.63
12	Muttam Ganga Raju	Kamaiahkunta	99.9	38.0	181.75	6.07	0.12	0.25	2.77	0.14	7.67
13	PusamGangaraju	Kamaiahkunta	90.7	37.5	112.77	5.99	0.07	0.26	7.32	0.38	5.78
14	KusramRamudu	Kamaiahkunta	111.6	37.5	199.53	6.40	0.12	0.26	14.0	0.42	9.75
15	KovvasiPosirao	Kamaiahkunta	90.8	39.2	187.82	5.36	0.08	0.25	9.03	0.40	6.37
16	MadiviDurgarao	Lankapalli	99.7	37.5	116.74	5.76	0.05	0.34	11.37	0.39	9.76
17	MadakamLakshmu	Lankapalli	95.0	38.5	95.74	6.17	0.08	0.29	12.37	0.48	7.53
18	MadiyamKannaiah	Lankapalli	99.7	37.5	180.78	6.14	0.06	0.25	21.17	0.51	6.88
19	VangaRamulu	Lankapalli	99.7	37.5	209.0	6.28	0.05	0.32	10.74	0.41	5.83
20	VangaSingaraju	Lankapalli	99.7	37.5	140.84	6.34	0.07	0.28	5.59	0.83	7.76

Based on the soil test results, in addition to the recommended dose of fertilizers 15 Kg of organic manure as basal application and micro nutrients spray at nut formation stage were applied. Critical inputs urea, potash and micro nutrients were provided to these farmers to help them in timely application of manures. The season was congenial and good flower and fruit set was observed in these orchards.

Cost of cultivation

The cultivation cost in cashew is calculated by field survey through structured questionnaire. The information regarding the establishment cost, recurring cost was collected. The essential operations were priced based on the local prevailing wages and cost. The details of cost of cultivation calculated are as given in the table-5.

Table 5: Factor wise cost of cultivation in cashew in West Godavari district of AP (before demonstration)

Establishment cost	Rs./ha.	Recurring cost	Rs./ha.
Preparation of land	4000	Filling of gap	520
Digging	3750	Pesticides & fungicides	1500
Filling of pits	1500	Labour charges	1860
Cost of plants	8000	Fertilizers	3300
Maintenance of land	3000	Harvesting by labour	300
Fencing	2000	Pruning and cleaning	400
Others	200	Marketing cost	900
Total cost	22450	Total cost	8780
Grand total			31230

As per the information collected through survey, it was observed that, the cost involved in land preparation, digging of pits, fencing, cost of planting material was the major amount involved in establishment cost. The total establishment cost was calculated as Rs.22450/ha. The recurring cost of cashew orchard was calculated as the expenditure on pesticides, fertilizers, pruning and cleaning, marketing cost, wage paid for different works etc., it was observed a total of Rs.8780/ha was spend on recurring costs.in this region cashew orchards grown based on rainfall, no irrigation was given to the crop. Marketing cost was calculated as Rs.900/ha which included the transportation cost, bagging and any tax paid in marketing.

Table 6: Factor wise cost of cultivation in cashew in West Godavari district of AP (After demonstration)

Establishment cost	Rs./ ha.	Recurring cost	Rs./ha.
Preparation of land	4000	Filling of gap	520
Digging	3750	Pesticides & fungicides	2300
Filling of pits	1500	Labour charges	2960
Cost of plants	8000	Fertilizers	3900
Maintenance of land	3000	Harvesting by labour	600
Fencing	2000	Pruning and cleaning	2600
Others	200	Marketing cost	1500
Total cost	22450	Total cost	14380
Grand total			36830

The cost of cultivation in cashew after demonstration was calculated as Rs. 36830/ha. There was no change in establishment cost but the recurring cost was increased as Rs. 14380/ha. due to additional cost paid towards fertilizers, pruning and removal of infested and dried tree parts, spraying of need based pest and disease management chemicals, harvesting, drying and grading of nuts before taking to market and collective marketing at one place to get more negotiated price.

Comparative analysis of per hectare cost and returns of cashew crop in West Godavari district of AP.

The yield and income in cashew demonstration plots revealed that the cashew crop responded well to the improved nutrient management combined with canopy management and timely pest and disease management. After demonstration the yield details, gross income and cost of cultivation were given in table no-6. the yield was doubled and tripled in demonstration plots in comparison to the farmers existing practices. During 2014-15 and 2015-16 the average yield of cashew is 370.5 kg/ac. and 837 kg/ac. Gross income during 2014-15 and 2015-16 is Rs.40590/- and Rs. 148369/-. In case of cost of cultivation during 2014-15 and 2015-16 is Rs. 7265/- and Rs.11250/- respectively.

The results clearly indicated that the productivity in cashew in less fertile soils with low nitrogen, medium phosphorus and potassium and low available micro nutrients can be increased with integrated crop management practices. The average additional income generated was @ Rs. 62880/- per hectare

which was found to be considerable income for the tribal farm families with an additional investment of Rs.4135/- per ac. The average cost benefit recorded was 1:7.97 indicating that cashew crop management as the sustainable livelihood source for the tribal farmers.

Another problem identified to affect the yields in these cashew orchards was the incidence of "Tea mosquito bug". The farmers expressed that about 15 to 35% of the reduced yields were recorded due to the incidence of tea mosquito bug during the previous seasons in the years 2012-13 and 2013-14. Large scale demonstrations for the control of Tea mosquito bug were conducted in 300 ac. of cashew orchards spread in fourteen villages of Buttiiahgudem and Jeelugumillimandals. The programme was implemented with the support of NGOs working in agency areas of West

Godavari District. The field staff of these two NGOs along with the farmers were trained to create awareness and skill in using the package for the Integrated Crop Management (ICM) in cashew as per the recommended package of Cashew Research Station, Bapatla under Dr. YSR Horticultural University (SAU), Andhra Pradesh.

The critical inputs like fertilizers, Micro Nutrients, Neem soap, Chemical pesticides were provided under Tribal Sub plan funds provided by the ICAR-ATARI, as a part of the regular technical programmes for the year 2015-16. Series of meetings and focused group discussions were conducted with the farmers at village level. A total of 223 farmers participated in these programme. The field staff of NGOs facilitated the timely application of the package.

Table 7: The Yield, Income and cost of cultivation in Demonstration Plots

S. No.	Name of the farmer	Yield Kg/ac		Gross income Rs.		Cost of Cultivation		CB Ratio
		2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	
1	Kottam Gangadevi	320	870	35,200	1,07,445	7,500	11,500	1:8.34
2	Kavam Kannaiah	480	1260	52,800	1,55,610	8,000	12,500	1: 11.44
3	Kottam Mohanrao	490	1230	53,900	1,51,905	8,000	12,500	1:11.15
4	Madakam Bhuchiraju	360	440	39,600	54,340	4,500	8,500	1:5.39
5	Chintam Pentamma	220	590	24,200	72,865	6,500	9,500	1:6.67
6	Tellam Devaraju	340	620	37,400	76,570	7,500	11,500	1:5.66
7	Pedakam Bapiraju	490	980	53,900	1,21,030	8,000	12,500	1:8.68
8	Mutham Kodavamma	280	510	30,800	62,985	6,500	9,500	1:5.63
9	Tellam Durgarao	260	490	25,300	60,515	6,500	9,500	1:5.37
10	Pottodi Bulli Venkanna	350	650	38,500	80,275	7,500	11,500	1:5.98
11	Madivi Bhimaraju	480	1540	52,800	1,90,190	8,000	15,500	1:11.27
12	Muttam Ganga Raju	260	480	28,600	59,280	6,500	9,500	1:5.24
13	Pusam Gangaraju	210	820	23,100	1,01,270	6,500	9,500	1:9.66
14	Kusram Ramudu	490	1250	53,900	1,54,375	8,000	12,500	1:11.35
15	Kovvasi Posirao	450	810	49,500	1,00,035	8,000	12,500	1:7.00
16	Madivi Durgarao	220	640	24,200	79,040	6,500	9,500	1:7.32
17	Madakam Lakshmudu	470	680	51,700	83,980	8,000	12,500	1:5.71
18	Madiyam Kannaiah	490	980	53,900	1,21,030	8,000	12,500	1:8.68
19	Vanga Ramulu	270	670	29,700	82,745	6,500	9,500	1:7.71
20	Vanga Singaraju	480	1230	52,800	1,51,905	8,000	12,500	1:11.15

Farmers were further encouraged to go for collective marketing of the nuts collected. Digital weighing machines were provided by the Project Officer, ITDA, Kota Rama Chandrapuram (KR Puram) to support the activity. Involvement of middle men could be avoided with the active involvement of NGOs and support extended by the Department of Horticulture officials. A total of 57.8 tonnes of cashew nuts were marketed by these 223 farmers with an average price of Rs.123.5 per kg of nuts. Twelve percent yield increase was recorded over the last year (51.6 T). This activity was very much accepted by the farmers and were happy with an average increase income of Rs.31250/- per ac.

Further, the cashew farmer in this area are motivated to register a FPPO with about 2000 farmers as members with the collective support of NABARD, ITDA, Department of Horticulture, KVK and NGOs.

Conclusion

KVK, VR Gudem interventions on tribal cashew farmers i.e. trainings, demonstrations in Integrated Crop Management Practices, Collective marketing proved significant economic impact on the tribal cashew farmers. After KVK intervention a total of 57.8 tonnes of cashew nuts were marketed by 223 farmers with an average price of Rs.123.5 per kg of nuts. Twelve percent yield increase was recorded over the last year (51.6 T). This activity was very much accepted by the farmers

and they were happy with an average increase income of Rs.31250/- per ac.

References

1. Anonymous (2014). Model Profile for 1.0 ha Cashew Cultivation. <http://agricoop.nic.in/>
2. Haribabu K, Prasanna KB. 2015. Status of cashew in Andhra Pradesh. International Society for Horticultural Science. <http://www.actahort.org>
3. Senthil A, Mahesh MP. Analysis of cashew nut production in India. Asia Pacific Journal of Marketing & Management Review. 2013; 2(3):106-110.
4. Patil RM. A Geographical analysis of cashewnut processing industry in the Sindhudurg District, Maharashtra, 2010. <http://shodhganga.inflibnet.ac.in>