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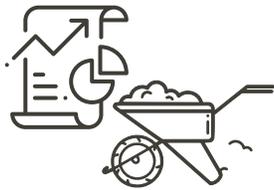
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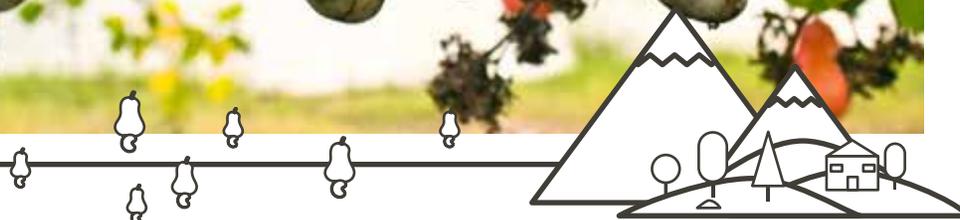


Introduction

The Mission 2020 - Lakahapati Kisan: Smart Villages -the program initiated by Collective for Integrated Livelihood Initiatives (CINI) a Tata Trusts associate organisation. The programs aim to improve livelihood of tribal farmers through irreversible income growth of one lakh for the family. The program will touch different livelihood aspects with other aspects like health. Vijayavahini Charitable Foundation (VCF) is adopting the same approach in Andhra Pradesh and Telangana and targeting marginalised households.

Vijayavahini Charitable Foundation is knowledge partner to SERP's Andhra Pradesh Rural Inclusive Growth Project funded by World Bank. The trust is testing pilot interventions in East Godavari district in selected three gram-panchayats with major focus on cashew value chain. Cashew is major horticultural crop in the area constituting large part of income to tribal families. The plantations in the region are around thirty years old and promoted through then government initiatives.





Purpose of the study

Vijayavahini Charitable Foundation (VCF) has identified Cashew Value Chain (CVC) as key intervention for income improvement and decided to implement the demonstrative project in Rajavommangi Block in Rampachodavaram TPMU E.G. District, Andhra Pradesh, Rajavommangi Mandal. Intercooperation Social Development India (ICSD) is selected to provide technical backstopping and facilitate marketing. ICSD will also provide knowledge products to ease the upscaling of demonstrative project and conduct knowledge events to capacitate project functionaries for improving implementation and fastmoving the activities.

The current study analyses pre-project scenario and covers varied facets of the project from field functionaries, value chain actors, enablers and facilitators, their capacities and provide detailed gap analysis. The study provides recommendations in details and then prioritises them for devising impact.

Study team and study period

The study is conducted in three Gram panchayats of Rajavommangi Mandal, the team comprised of cashew value chain expert from Intercooperation and two management functionaries of VCF. The study was completed in two days from 16-11-2017 to 17-11-2017.

The project location

Marginal and small farmers predominate in **East Godavari district**; 87% farmers are cultivating only 54% land while 14 % farmers who are medium to large are operating 46% of land . The CVC project is located in Rajavomangi Mandal of the district where more than 50% population is tribal. The selected three gram-panchayats (GPs) Badadanampalle, Lododdi and Sarabhavaram have 54.5%, 52.4% and 54.6% tribal population. The average landholding of this population less than 4 acre per family. Besides limited land resource, the challenges for the tribal farmers include low literacy rates (%), especially women, lower employment rate and high number of dependents in the family has aggravated the situation. The detailed demographic profile of the villages is presented below:



East Godavari district

Table 1: Demographics of Pilot Gram Panchayats

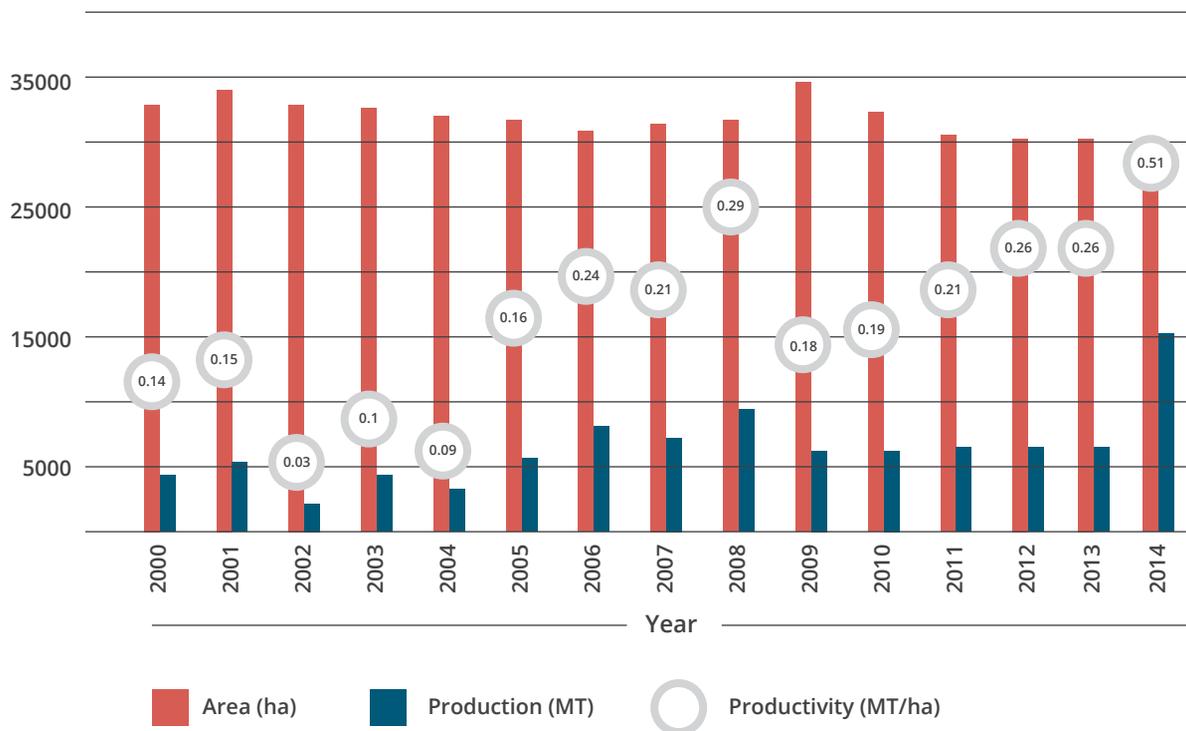
Particulars	Total	Male	Female	Total	Male	Female	Total	Male	Female
	BADADANAMPALLE			LODODDI			SARABHAVARAM		
Total No. of Houses	173	-	-	120	-	-	213	-	-
Population	549	279	270	475	269	206	615	273	342
Child (0-6)	56	27	29	46	15	31	39	21	18
Schedule Caste	2	1	1	0	0	0	2	1	1
Schedule Tribe	307	156	151	460	257	203	412	185	227
Literacy	54.5%	61.9%	46.89%	52.45%	66.14%	32.57%	54.69%	62.70%	48.46%
Total Workers	357	203	154	274	148	126	367	175	192
Main Worker	337	0	0	172	0	0	367	0	0
Marginal Worker	20	8	12	102	17	85	0	0	0

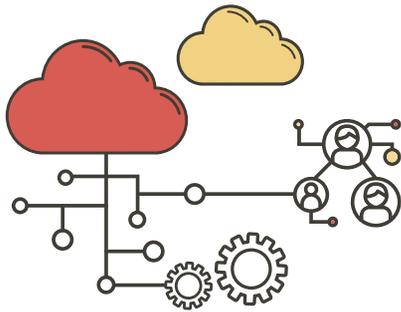
2 | Data source: Census data for Rajavommangi Mandal, 2011.

3 | <https://data.gov.in/node/87630/download> Ministry of Agriculture and cooperation, Gol.

Cashew production in East Godavari district.

Agriculture is major source of employment and income in the GPs; cashew is predominantly grown in the region. The cashew cultivation in the region dates to 1991 – 1992, then government promoted the cultivation by supporting tribal communities. However, the productivity of the cashew in the region is well below the national average which is 0.77MT/ha. The table below also indicates that area under cashew plantation has decreased over the years, in 2010 it was 34,581 ha which came down to 29,608. These are serious concerns and threat to cashew production in the district. However, though low than the national average, productivity has steadily increased over the years from 0.18 MT/ha in 2010 to 0.51 MT/ha in 2014.





2

Approach and Methodology

The situational analysis is carried in all the three GPs of the pilot project area Sarabhavaram, Lododdi and Badadanampalle. Following approach is adopted for the study.

2.1 Approach

Consultative approach: Initial consultation were held with Vijayavahini Charitable Foundation, to collect project information and intervention details. The consultations were also held for devise sampling methodology.

Competent team: The cashew expert with more than 8 years' experience is provided for the study who conducted field visits for primary data collection. The expert is also supported by Value chain expert for developing data collection tools and planning the survey.

2.2 Methodology

Primary data collection: Primary data is collected through structured questionnaire for individual interviews and key informant interviews as well as focused group discussion. The structure questionnaires and checklists are annexed to the report

Sampling: Random sampling method is used for the data collection, equal number of samples collected from each village. Following is the coverage for samples

1. **Key Informant interviews (KII):** 5 (Sarpanch, SERP staff, VCF staff)
2. **Focused Group Discussion FGD:** 3 with 20 participants each, total participation: 60
3. **Individual farmer interviews:** 15 (5 from each village)

Total respondents: 80.

Secondary data collection: Secondary data collection sources are as listed below

1. *Department of Agriculture*
2. *Web portals of Ministry of Agriculture and cooperation*
3. *Web portal of State agriculture university*
4. *Other publications available on open sources.*

Data analysis: Collected data is digitalised and analysed using regular excel format, qualitative data is verified and used as and when required in the report.



FGD at Badadnampalle Village



Gap analysis

The situational analysis identified critical gaps in the value chain of cashew. The gaps are classified based on the actors, systems and institutions involved in the value chain. The identified gaps are detailed below

3.1 Production

Production gaps are identified from interactions with producers.

Low plant population:

The average plant population recorded in the three GPs is 55 per acre highest plant population is observed in Sarbhavaram village with 67 trees/acre and lowest is observed in Badadanampalle with 47 trees/acre. The recommended plant population for cashew plantation is 80 trees/acre by Acharya N G Ranga Agriculture University with recommended row to row and plant to plant spacing of 7meter by 7meter.

Table 3: Orchard scenario in pilot project

GPs	Cashew Area	No. of Trees	Trees per acre	Non-yielding Trees per acre	Diseased Trees per acre
Sarabhavaram	2.5	150	60	2	2
	2	120	60	2	1
	3	200	67	2	1
	2.5	120	48	1	2
	2.5	120	48	2	1
Lodadhi	2	110	55	2	2
	3	180	60	2	1
	4	250	63	2	1
	3	160	53	1	1
	2	100	50	2	1
Badadanampalle	2	100	50	1	2
	3	150	50	2	1
	1.5	80	53	3	3
	1.5	70	47	1	1
	1	55	55	1	2
Averages	2.37		55	2	1

Combined with lower plant population there is also an incidence of diseases and non-yielding trees decreasing further healthy yielding plant population and overall yield of the orchards. On verification it is observed that the average non-yielding plants per acre are 2 while diseased plants 1.



Conventional soil management practices:

The soil management practices for cashew orchards in Rajavommangi Mandal are restricted to activities like deep ploughing and chemical fertiliser application, such inefficient practices result into following issues:

- i. Decreasing percolation of water and increased surface runoff due to thickening of upper soil layers after repetitive deep ploughing, ultimately resulting in lower yields.
- ii. Substantially Increased cost of cultivation as the average cost of ploughing per acre is ₹800/-
- iii. Fertiliser application confined to chemical fertiliser with supplemented use of nitrogenous fertilisers, triggering vegetative growth.
- iv. Wasted investments in fertilisers further upsurge cost of cultivation, the average cost of fertilisers borne by the farmer is ₹2757 per acre
- v. The total soil management practices costs ₹3557/- per acre.

The observed costs for soil management practices are explained in below table.

Table 4: Soil Management cost in current production system

GPs	Cashew Area	No. of Trees	Urea	DAP	Potash	Others	Total Fertilizer	Cost per acre	Ploughing Cost	Soil Mgmt. cost
Sarabhavaram	2.5	150	2	2	2	3	7680	3072	2000	9680
	2	120	2	2	1	2	5940	2970	1600	7540
	3	200	3	3	2	2	8400	2800	2400	10800
	2.5	120	2	2	1	3	6860	2744	2000	8860
	2.5	120	2	2	1	3	6860	2744	2000	8860
Lodaddi	2	110	2	3	1	2	7260	3630	1600	8860
	3	180	3	3	2	2	8400	2800	2400	10800
	4	250	3	2	3	2	7900	1975	3200	11100
	3	160	3	3	2	2	8400	2800	2400	10800
	2	100	2	2	1	1	5020	2510	1600	6620
Badadanampalle	2	100	2	3	1	1	6340	3170	1600	7940
	3	150	2	2	2	2	6760	2253	2400	9160
	1.5	80	1	1	1	1	3380	2253	1200	4580
	1.5	70	1	1	1	1	3380	2253	1200	4580
	1	55	1	1	1	1	3380	3380	800	4180
Averages	2.37	55	2.07	2.13	1.47	1.87		2757	800	3557

Overlooked plant protection

Recurrent attacks of “T” mosquito bug (TMB) and presence of stem borer in cashew orchards are major cause of production losses. The State Agriculture University (SAU) estimates indicate 30% losses due these pests. In line with the SAU, producers of Badadnampalle village during FGD claimed that if tree is infested with TMB it will not yield any cashews.

None of the interviewed farmers and FGD participants admitted practice of pest control operations in cashew orchards and cited reasons for non-practice are as below

- i. Lack of knowledge and skills in pest control
- ii. Limited access in the vicinity.
- iii. Inaccessibility to power sprayers required to reach plant height.
- iv. High cost of rented services for power sprayers upto ₹700/- per acre.

The insufficient skills and knowledge, high costs and accessibility to implements result into ignorance towards pests.

Unscientific harvesting methods

The advocated method of harvesting cashew nuts by KVK Rampachodavaram is by collection of dropped ripen fruits.

However, the routine practice of harvesting in the pilot project region is by plucking the apples and nuts from the trees with long bamboos. The fruit bunches are beaten to release the fruits followed by collection and separation of RCN from apples. This results in collection of unripen or partly ripen cashew nuts, having lower quality than market standards, causing devaluation of produce at markets.

This is major capacity gap as producers fail to understand quality and value relationship for the produce. The gap also provides opportunity to market actors for notional devaluation of produce.

Farmers of Lododdi estimated cost of cultivation: The lododdi village farmers, during focused group discussion estimated cost of cultivation for one acre cashew orchard. the estimates included family labour of 60 days. the cost of cultivation is estimated at ₹15000/- per acre. the soil management practices have 27% share in total costs and labour costs constituting 73% of total cost.

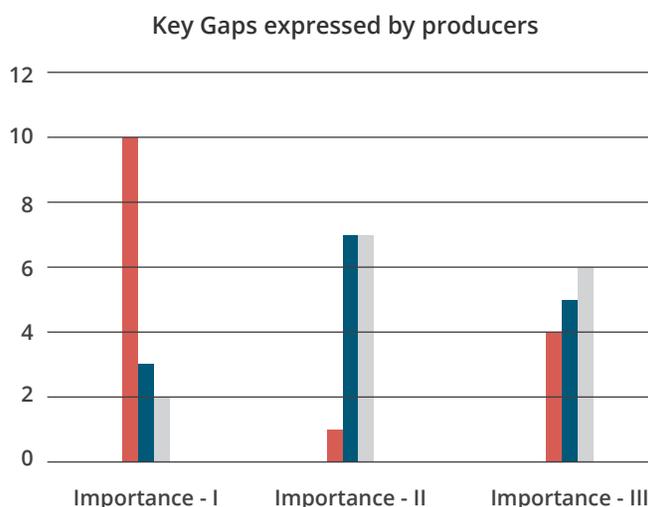
Low yields

Recorded cashew yield of the state is 0.57 MT/ha in East Godavari district it is 0.51MT/ha only. The observed yield in the project region is 0.54 MT/ha. Though the resulted yield is more than that of district it is slightly lower than the state average. However, the national average is way much higher than the pilot region at 0.70MT/ha. The yield gap is also high when compared with

observations and indications from State Agriculture University (SAU) which 1MT/ha after following recommended cultivation practices and using recommended cultivars.

Tuned markets for non-pricing 'RCN' on quality parameters: The trader from lododdi claimed that he accepts the un-dried rcn and directly transports them further to processor. according to him "it is processors responsibility to dry the rcn." this indicates that quality based pricing practices are not common in the market and opportunities for producers to have incentives for the quality are strategically controlled by processors.

During producer interactions they identified few important gaps and assigned importance to each gap. The following figure shows the importance expressed by producers.



Key Gaps expressed by producers

Producers ranked Sapling as the most important gap and think that it can boost production as well as it will be most sustainable intervention. The Sprayer and trainings are equally important and share second place. Sprayers help in reducing pest attacks and save on losses while trainings on scientific production can add value by providing critical insights.

3.2 Post-harvest management

Post-harvest gaps are identified with producers during FGDs and through KII's of village leaders.

Absence of drying tradition

Freshly collected nuts have moisture content up to 14%, the market accepted moisture content for the RCN is 9% . Producers from the pilot region sell freshly collected cashews in 4-5 hours after harvesting, with maximum moisture content. This is plummeting the overall quality of RCN and resulting in lower price realisation.

The gap is due to inadequate knowledge on drying practices and low awareness on RCN quality parameters as well as on market offerings for different qualities.

Poor storage practices

The RCN are hardly stored by the producers as the sale is practiced on daily basis, with traders visiting villages frequently. However, in rare instances cashews are stored openly without packing inside thatched houses, this further attract moisture and fungus on wet cashew nuts. The ash green colour of cashew may turn to grey or dark black due to fungal attacks and decrease the quality of cashew.

The capacity gap is identified in this scenario as producers' lack skills for storage, they also miss the price opportunities arising during off seasons.

3.3 Marketing

Marketing gaps are identified during FGDs, KII's of village leaders and traders.

Over dependence on traders

Multirole playing traders offer advances and credits on interest of 36% per annum to producers for non-commercial activities like marriages and hospitalisation, input supply is also routed through same traders, where producers buy most of the inputs in form of packages for cashew as well as other crops. The total financial support served by traders who are encashing on absence of creditors and non-priority to cashew by financing institutions.

Traditional market cultures

Mechanical weighing balances are still used in the region allowing false weighing practices and lessening transparency in trades. Through electronic balances are slowly becoming popular after interventions from National level processors and few SERP initiatives, it is still the practice in interiors.

Promoted FPOs of the project are not enough equipped with electronic weighing machines.

Absence of alternate marketing opportunities

Alternate marketing opportunities are being promoted by the project through collectivisation. The promoted institutions are still inactive in the businesses. Tied commercial partners are transacting with producers through appointed traders, side-lining collectives. The single commercial partner networking through local traders for procurement dilutes the opportunity for changing marketing practices and providing alternate market options.

3.4 Enablers

Unapproachable credit institutions

“Banks, Non-banking Financial Institutions and even credit cooperatives in the region don’t have cashew as priority crop for financing”- reply by HDFC bank representatives in the region, clears that there are no formalised channels for availing credit for major crop of the region. Recorded responses from the producers also indicate towards distant branches of banks up to 40 km, directing towards not only limited access to finance but even towards non-viability of trade transactions for cashew sale through banking systems.

The gap in availability of credit and access to formal banking is further endorsing dependence on traders.

Detached input supply

The low plant population, ignorance towards pest control and credit purchase of inputs from traders are consequences of detached input supply, the nearest input provider is at 30 km distance from pilot region as described by the farmers from Sarabhavaram village during FGD, similarly the nearest nursery for saplings is 120 km away. The cost of carriage for individuals from distant places is very high demotivating farmers for practicing recommended cultivation packages. There are no local vendors for plant sapling as well as pesticides.



3.5 Facilitators

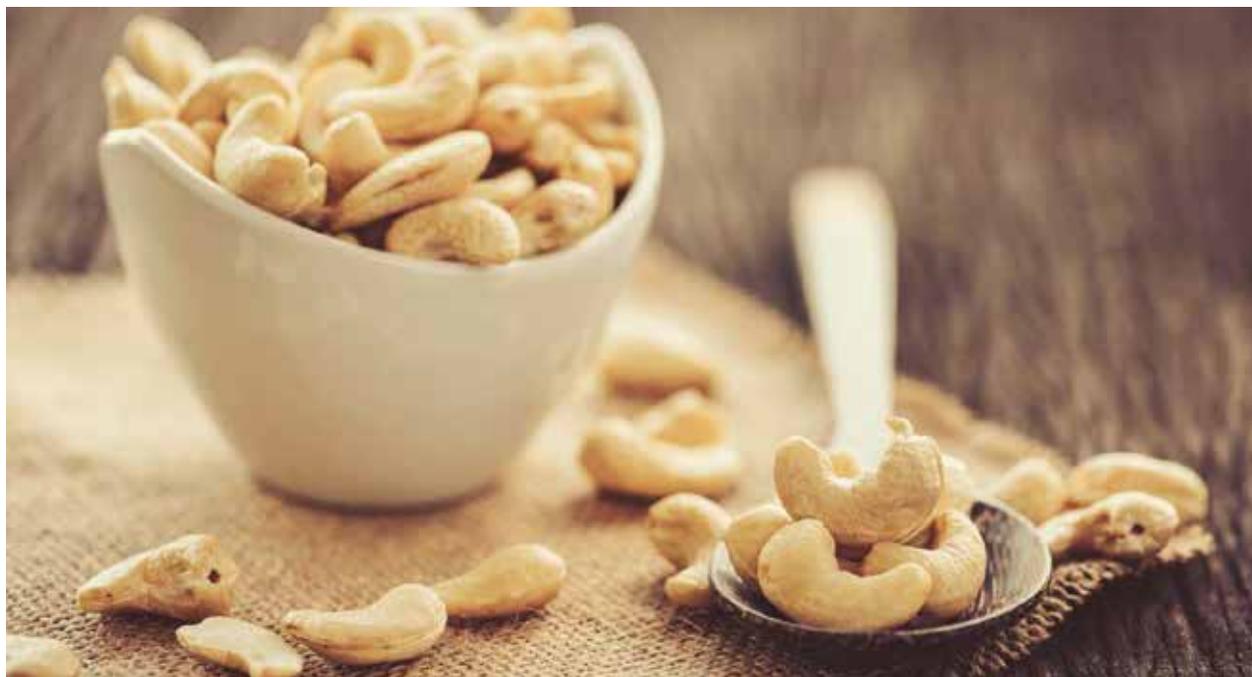
Limited capacities of extension agencies

SERP and VCF are implementing the pilot with staffs who have limited skills in cashew production and marketing, in fact during interviews and interaction with staffs the first-time implementation feel was more evident. Their experiences in the other fields are being applied for implementing of pilot which did not work. The capacity gaps of staffs, managers as well as community resource persons needs to be minimised on priority.

Inadequate capacity building initiatives

The producers from the pilot region during individual interactions and FGDs asserted, that they have not received any formal trainings on standard cashew cultivation and marketing practices. Their knowledge on cashew production and marketing is limited and they follow the traditional farming path. They are never exposed to model farms and cashew collectives or processing facilities. However, there are informal discussions with project staffs and department functionaries which forms the source of knowledge, besides this trader share some critical insights in production, during trade interactions.

The limited knowledge and skills is major hindrance in development of cashew value chain.





Recommendations

The recommendations here are result of detailed gap analysis, they provide all-inclusive set covering every aspect of value chain. However, they provide further scope to prioritise based on project objectives.

4.1 Production

Gap filling and skilling locals for nursery

The plant population needs to be corrected from 55 plants/acre to 80 plants/acre. Average 25 saplings are required per acre. This huge gap can be minimised by diminishing the cost per sapling. Identified and interested locals can be skilled for nursery development and marketing, this will create business opportunity at the same time serve as major boost to gap filling and replacing aged orchards of 30 – 32 years.

Intercropping in orchards

Gap filling in orchards will introduce new saplings in the field however the canopy coverage will still be limited during juvenile stages offering opportunity for intercropping. The leguminous intercrops like pigeon pea, black gram, cow pea and green gram will offer additional income from unutilised space of farm at the same time improve soil quality - being natural nitrogen fixing agents.

Promoting soil and water conservation

Soil and water conservation techniques like mulching, trenches around the tree trunks and bunding can protect the soil health and provide water to plants for longer duration after monsoon. Mulching and trenches are identified popular practices in commercial cashew production.

Custom hiring centre (CHC) for power sprayers

The costs for plant protection and losses due to pests can be reduced through promotion of community managed custom hiring centres, which will provide power sprayers as well as other agriculture implements on rental basis. The centre will operate on minimum charges to cover maintenance and depreciation costs, instead of booking profits it will transfer benefits to producers. Producers will utilise the implements and pay marginal costs which will be way-lower than the market rates.

Collective Input procurement

The collective procurement of pesticides and fertilisers through collectives can ensure easy availability of inputs in the project area. This action will also help in reducing overall costs of inputs through bulk purchase mechanism. The partial benefits can be transferred to members and collectives can also keep service charges building their financial strengths.

Capacity building of project functionaries

The project functionaries can be trained on various production as well as marketing aspects in cashew value chain. The capacity building initiatives can also focus on exposures and on-farm trainings which will allow deeper understanding of technical aspects in production and marketing.

Knowledge products

Standard operating procedures (SOPs) with a detailed guideline along with training modules are required to guide the project functionaries during pilot implementation as well as for upscaling the takeaways of pilot project.



Capacity building of producers

The capacity building of producers on production practices, package of practices for crop cultivation, post-harvest management as well as on collective sale and role of members in collectives are required since producers are asserting on capacity building.

Guiding producers and monitoring farm activities

Capacity building of staffs and producer will not suffice the overall objective of the project, continuous guidance on production and monitoring the farm operations in initial years will encourage producers to follow the recommended practices of the project. Crop calendars, leaflets and brochures along with inputs from field visits project staff will keep the producers motivated. Crop diaries at producers' level will allow recording of operations and field observations of the staffs for particular farm. Crop diaries can also track the production over the years and help producers in devising the marketing strategy.

Demonstrating model cashew farm

The model farms will allow producer a real-time experience and on-farm training opportunity, these will also set examples and motivate farmers for replicating production practices. Three model farms can be developed one in each gram panchayat. The model farm will present all the ideal practices and project recommended production techniques customised for project stakeholders.



4.2 Post-harvest management

Capacity building of producers on post-harvest management focused on drying techniques and storage techniques is recommended to improve the quality of produce.

Community resource persons can monitor the overall practice and provide consultations to producers on post-harvest management.

4.3 Marketing

Introduction of digital balances

Digital balance will bring transparency in trades and offer alternate weightment options to farmers, reducing malpractices in marketing.

Introduction of moisture meter

Moisture meters allow to check quality of nuts, the lesser moisture containing nuts can be incentivised by negotiating with commercial partners of the project.

Diversifying for marketing

To decrease the dependence on single buyer and encourage competition collectives can take lead and invite more buyers through bidding processes. In case bidding processes are confusing and inappropriate for collectives open-auction method can also be adopted. Appointment of marketing consultants can help collectives to take the produce to wider markets as well. Overall diversification will offer bouquet of opportunities.

Capacity building of Board directors

Building capacities of board directors of collectives in business planning, financial management and marketing management will ensure sustainability and make collectives self-reliant. It will also facilitate financial linkages and increase opportunities of external funding for collectives.

Handholding of collectives

Handholding for finance and marketing management with onsite guidance for operations is required for nascent stage collectives, struggling collectives due to lack of skills and knowledge required sufficient period to standalone and progress.

Prioritised recommendations

The recommendations presented above has wide range of applications and can span for short as well as long term. Objectives of the project don't allow long run also the specification of increasing income limit the scope of few recommendations. Considering project objectives and shorter time span maximising the impact with limited time frame is important call.

The priorities in figure below illustrate the importance of recommendation based on time and efficiency of the recommendations. However, the project interventions can be devised considering early start of few interventions or delayed implementation of few high impact short term interventions based on the experience of community's receptive nature.



High Impact

SHORT TERM

- Inrcropping with leguminous crops
- Adoption of SoP
- Capacity building on harvesting methods
- Introduction of digital balance
- Introduction of moisture meter
- Diversifying markets

LONG TERM

- Capacity building of staffs
- Capacity building of farmers
- Gap filling and skilling of locals in nursery
- Demonstrating model farms
- SWC activities
- Post-harvest managment

SHORT TERM

- Custom Hiring Centre
- Collective input procurement

LONG TERM

- Capacity Building of BoD

Low Impact

Prioritised recommendations

STANDARD OPERATING PROCEDURE

Implementing Cashew Value Chain for Rural Poor



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1.0 Introduction

Cashew (*Anacardium occidentale*) is cultivated widely throughout the tropics and the crop is adapted to warm humid tropical conditions. Global production of cashew reached 738,861 metric tons (MT) in 2015-16, seeing an average jump of 43 percent in cashew production globally in the last decade. India led the production of cashews in 2015-16 with a crop of 172,719 metric tons (kernel basis), representing 23 percent of global production. World consumption of cashew has seen an increase to 7,16,682 MT in 2014 from 4,69,241 MT in 2010. Estimated cashew consumption on kernel basis has been highest in India (224384 MT) followed by USA (128,342 MT) and China (52,159 MT).

There is a clear demarcation in geographies producing and consuming cashews, and India has a place both as a key producer and as a consumer. In India, commercial cultivation of cashew is taken up in eight states - Andhra Pradesh, Goa, Karnataka, Kerala, Maharashtra, Orissa and Tamil Nadu. Nearly two million small and marginal farmers from coastal belts of India are directly and indirectly involved in cashew cultivation, processing and marketing, with more than 90 percent of them being women. Lack of farmers' collectives and poor bargaining power is resulting in low price realization for the producers. Gender role distribution across the cashew value chain is skewed, with women involved in high drudgery and low margin activities, having very limited control over assets and resources, and negligible decision-making power in cashew production and trade matters.

2.0 Soil Type

The general notion is that "cashew is very modest in its soil requirements and can adapt itself to varying soil conditions without impairing productivity". But cashew performs much better on good soils than on poor soils. The best soils for cashew are deep, friable well drained sandy loams without a hard pan. Cashew also thrives on pure sandy soils although mineral deficiencies are more likely to occur. Water stagnation and flooding are not congenial for cashew.

3.0 Climate

Cashew is a tropical plant and thrives in high temperatures. Young plants are sensitive to frost.

Areas where the temperatures range from 20 to 30° Celsius with an annual precipitation of 1000 - 2000 mm are ideal for cashew growing. Heavy rainfall, evenly distributed throughout the year, is not favorable for cashew. It needs a climate with a well-defined dry season of at least four months to produce the best yields. Coincidence of excessive rainfall and high relative humidity with flowering may result in flower/fruit drop and heavy incidence of fungal disease. Cashew is regarded as "essentially coastal tree" but that is not true. It also grows well at considerable distance from the coast.

4.0 Cashew Varieties

ICSD's field research in different locations have identified elite materials for crop improvement with yield potential ranging between 8 – 10 kg per tree. Several varieties have been released by the different research coordinating centers of ICAR. All the State Agricultural Universities and Research Centers have established bud wood bank with the released varieties of respective centers, for further multiplication and distribution. Some important varieties which can be adopted to the project area in Andhra Pradesh are

BPP-1 : High percentage of perfect flower, 13.2%, fruit set high, yield 17 kg (25 year old plant)

BPP-2 : Yield 19 kg/tree (25 years), shelling 26%, nuts 4g average.

BPP-3, BPP-4, BPP-5 : are also other good varieties.

Vengurla-1 : Average yield 23 kg/plant at 28 year's age, nut weight 6g, shelling 31%.

Vengurla-2 : Yield 24 kg/plant at 20 year's age, nut weight 4 g, shelling 32%.

Vengurla-3 : Nut weight 9 g.

Vengurla-4, Vengurla-7, VRI-1, VRI-2, Ullal-1, Ullal-2, Anakkayam-1, BLA 39-4, K-22-1, NDR 2-1, K-22-1 and NDR 2-1 are good export varieties.

5.0 Preparation of Land

It is better to select the land having good drainage and devoid of sub-surface hard rock or hard pan for successful cultivation of cashew. The land should be ploughed thoroughly and levelled in case of agricultural lands. In case of forest lands, the jungle should be cleared well in advance and the debris burnt. After clearing the jungle, land is to be terraced or bunds constructed in sloppy land. Pits of 60 cm³ are to be dug and allowed to wither.

6.0 Planting Materials

Cashew can be propagated by seedlings, air layers and softwood grafts. Since it is a cross-pollinated crop, vegetative propagation is recommended to obtain true to type progeny. Field establishment of air layers has given poor results. Hence softwood grafts, which give a high rate of establishment and early flowering, are recommended for planting.

7.0 Propagation by Seedlings/saplings

There are two sources of seedlings basing on the availability and quality:

7.1 By own selection and creation

The mother trees are selected in February. Trees having good health, having 15-25 years of age, bearing 7- 8 nuts per panicle and having nut weight 5-8 g/nut are considered for selection.

The seed nuts are collected in March-April.

The seedlings are raised in polythene bags during May.

The mature, medium sized nuts, which sink in water after drying in sun for two to three days may be used for raising seedlings.



7.2 Integrated Tribal Development Agency

Most of the tribal farmers are being supported with the saplings from Integrated Tribal Development Agency (ITDA). Financial aid for planting of the saplings with allied activities such as pitting of cashew saplings are also provided by ITDA.

7.3 Raising Seedlings

Seedlings raising is undertaken in polythene bags during May.

Polythene bags of size 20 cm x 15 cm are filled with garden soil. A gap of 1 to 1.5 cm is left on top.

The seed nuts are soaked in water for 18 to 24 hours for hastening germination.

The pre-soaked seed nuts are sown in polythene bags filled with garden soil at a depth of 2-3 cm with the stalk end up. Seeds germinate in seven to ten days.

8.0 Propagation by Grafting / Budding

Different methods of grafting viz., epicotyl grafting, softwood grafting, veneer grafting, side grafting, patch budding etc. have been tried in cashew with varying degrees of success. Among them, softwood grafting was found to be the best for commercial multiplication of cashew.

8.1 Softwood Grafting

8.1.1 Selection of seed nuts

The steps in seed nuts selection is as follows:

Seed nuts may be collected during the peak period of harvest (February-March) and sun-dried for 2-3 days.

Quality seed nuts may be selected by immersing in water or 10 per cent saline solution.

Seeds, which sink in water, may be selected.

Medium sized nuts (7-9 g) may be selected to get vigorously growing seedlings.

Days may be used for raising seedlings.

8.1.2 Raising rootstocks

For raising rootstocks, the following steps are followed:

Fresh seed nuts are to be used for raising rootstock. Seed nuts stored for more than one year may be avoided.

The seed nuts should be soaked in water overnight before sowing.

Use polythene bags (size 25 cm x 15 cm, 300 gauge thickness) for filling potting mixture. Punch about 16-20 holes on the polythene bags to ensure good drainage.

Prepare the potting mixture (1:1:1 ratio of red soil, river sand and compost) mixed with rock phosphate @ 5 g per 2 kg potting mixture.

Fill the polythene bags up to the brim of the bag.

Sow the pre-soaked nuts in the centre of the bag with stalk end up, at a depth of 2.0-2.5 cm.

Water the bags immediately after sowing and daily thereafter. Avoid excess irrigation.

Nuts usually germinate within 15-20 days after sowing during monsoon months and within 8-10 days during dry months.

Nuts should be sown at weekly intervals to get continuous supply of rootstocks.

During summer, provide partial shade to the seedlings till they change their bronze colour to green and then keep them in the open.

The seedlings will be ready for grafting in 50-60 days after germination.

Prevent damage to germinating nuts from squirrels, birds etc.

During the rainy season, damping off of young seedlings is common. To control this disease, spraying / drenching Bordeaux mixture (1 per cent) is effective.

8.1.3 Selection of rootstock

Select 50-60 days old healthy seedlings having single main stem grown in the centre of the polythene bag, as rootstock.

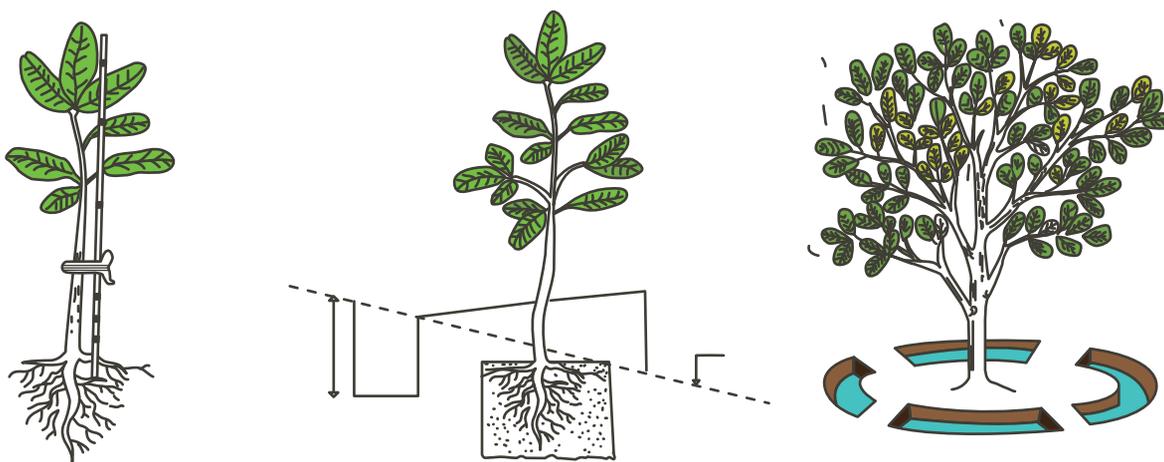
8.1.4 Selection of scion sticks

The steps for scion stick selection are

Select a high yielding variety of cashew as mother plant to collect adequate number of scions.

Select 3-5 month old non-flowering lateral shoots of current season's growth.

The selected scions should be 10-12 cm long, straight, uniformly round and pencil thick with brown colour having dormant plumpy terminal bud. The top 4-5 leaves should be dark green in colour indicating proper maturity of the scion.



Stages of cashew grafting

8.1.3 Selection of rootstock

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8.1.5 Pre-curing

Pre-cure the selected scions by clipping off three fourth portions of leaf blades.

Scions will be ready for grafting in 7-10 days after leaf removal.

8.1.6 Collection of scions

The pre-cured scions are to be cut early in the morning to avoid desiccation.

The scions should be collected before the terminal buds sprout.

Wrap scions in moist cloth and put in polythene covers as soon as they are cut from the mother tree and bring them to the nursery for grafting.

If necessary, they can be stored for 3-4 days and used for grafting.

8.1.7 Preparation of rootstock

Retain two pairs of bottom leaves and remove others from the selected seedlings using a sharp knife.

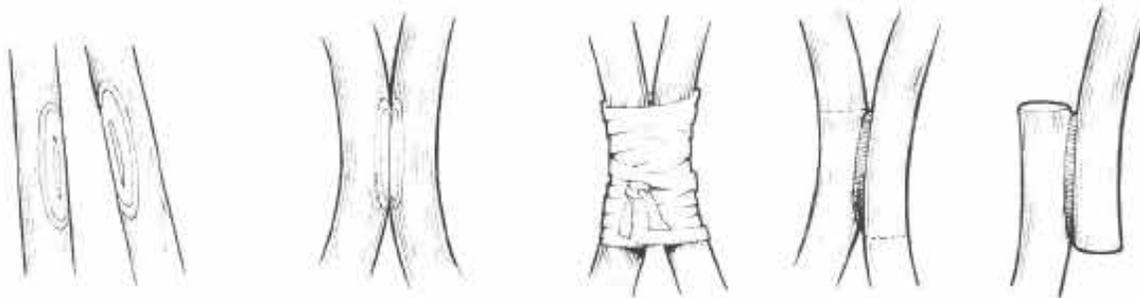
Give a transverse cut on the main stem, 15 cm above ground level.

A cleft of 4-5 cm deep is made in the middle of the decapitated stem of the seedling by giving a longitudinal cut

8.1.8 Preparation of scion

Select a matching scion stick (same thickness as that of the rootstock).

The cut end of the scion is shaped to a wedge of 4-5 cm long by chopping the bark and wood from two opposite sides.



Closer look at cashew plant grafting

8.1.9 Grafting

The wedge of the scion is inserted into the cleft of the rootstock, taking care to ensure that the cambium layers of stock and scion are in perfect contact with each other.

The graft joint is secured firmly by a polythene tape (1.5 cm wide and 30 cm long).

The scion of the graft is to be covered with a wet polythene cap (15 cm x 12.5 cm, 100 gauge thickness) and tied at the bottom to maintain humidity inside and to protect the apical bud from drying.

The polythene cap should not touch the terminal bud. A narrow polythene cover of size 20 cm x 3 cm (sip-up-cover) can also be used instead of above said polythene cap.

The grafted plants are to be kept under shade for 10-15 days to enable sprouting of the terminal buds.

The polythene caps are to be removed and the grafts shifted to open place. The successful grafts

Show signs of growth within 3-4 weeks after grafting.

The grafts will be ready for planting 5-6 months after grafting.

The success in softwood grafting is more during the period from March to September under Kerala conditions.

8.1.10 Care in the Nursery

The grafts are to be watered regularly using a rose can or micro-sprinkler.

Remove new sprouts emerging from rootstock at frequent intervals.

Panicles, if produced by the grafts, may be removed as and when observed.

Grafts should be placed on polythene sheets spread on the ground to prevent rooting.

Shift the grafts frequently from one place to another to prevent them from striking roots into the ground.

Spray recommended insecticides for controlling the infestation of sucking insects as and when required.

8.2 Graft production under Poly house

Softwood grafts can be prepared almost throughout the year with a mean graft success of about 60-70 per cent. Higher success is achieved during the monsoon season.

For this, low cost polyhouses (prepared from casuarina / bamboo poles / areca reapers / GI pipes / PVC pipes and covered with high density polythene sheet of convenient dimensions) preferably 20 m long and 6 m wide may be utilized for graft production.

The height of the polyhouse should be 2.5 m in the middle and 1.0 m on both sides.

The plants may be watered using hose. Misting units can also be fitted at appropriate points and switched on for about 5-10 minutes at an interval of two hours from 10 a.m. to 6 p.m. during summer season. This reduces the temperature build up inside the poly house.

Rising of rootstock seedlings, grafting of rootstocks and maintenance of grafts can be done inside the poly houses.

These poly houses give protection to the seedlings and grafts during heavy rains and reduce the mortality.

Again during summer months the seedlings / grafts can be maintained in these poly houses by covering with HDPE shade nets (35-50 per cent shade).

8.3 Planting and Management of Grafts

The softwood grafts will be ready for planting in 5-6 months after grafting.

The pits are filled with topsoil and 5-10 kg of compost or dried cow dung / pit and the grafts are planted after carefully removing the polythene bags.

Care should be taken while planting to see that the graft union is 2.5 cm above the ground level.

The polythene tape is to be carefully cut and removed subsequently. Staking should be done immediately after planting to avoid lodging.

9.0 Planting and Management of Plantation

Plant softwood grafts in pits of size 50 cm x 50 cm x 50 cm during June-July.

Planting may be done at a spacing of 7.5 m for poor and 10 m for rich and deep soils and sandy coastal area.

On very sloppy lands, the rows may be spaced 10-15 m apart with spacing of 6-8 m between trees in a row.

Depending upon the weed growth, weeding operation may be done during August-September.

Mulch the plant base with dry leaves to reduce sun-scorch to tender plants.

A minimum of 80 plants should there in one acre of orchard.

10.0 Initial Pruning / Shape pruning

The sprouts coming from the rootstock portion of the graft, which is from the portion below the graft joint, should be removed frequently during the first year of planting.

Initial training and pruning of young cashew plants during the first 3-4 years is essential for providing proper shape. Thereafter, little or no pruning is necessary.

The plants should be allowed to grow by maintaining a single stem up to 0.75-1.00 m from ground level. This can be achieved by removing the side shoots or side branches gradually as the plants start growing from the second year of planting.

Weak and crisscross branches can also be removed. Branches growing un-widely may also be cut off.

Proper staking of the plants is required to avoid lodging due to wind during the initial years of planting.

Initial training and pruning of cashew plants facilitate easy cultural operations such as terrace making, weeding, fertilizer application, nut collection and plant protection.

The flower panicles emerging from the grafts during the first and second year of planting should also be removed (de-blossoming) in order to allow the plant to put up good vegetative growth.

The plants are allowed to flower and fruit only from the third year onwards.

11.0 Regular Pruning

In older cashew plantations, removal of dried or dead wood, crisscross branches, water shoots etc. should be attended to at least once in 2-3 years. This allows proper growth of the canopy and receipt of adequate. Sunlight on all the branches.

Pruning of cashew plants should be done during May / June.

12.0 Intercropping

Pineapple is the most profitable intercrop in cashew plantation in the early stages of growth. It can be planted between two rows of cashew in trenches opened across the slope. Paired row of pineapple suckers can be planted in each trench at 60 cm between rows and 40 cm between two suckers within the row. These trenches can be opened at 1 m between two rows of cashew.

Ginger, lemongrass and pulses are also suitable as intercrops. The most suitable inter crop may be the pulses which will give additional income of INR 6,000 to 7000 per acre per annum.

13.0 Pest and Diseases Management

If the crop/plantation is affected by pest it should not be ignored. Immediate action should be initiated through trust advisory service

Mono cropping should be avoided while taking intercrop

Adopt soil and water conservation measures in cashew plantations. (trenching, cradle pits, mulching etc.)

To reduce the spread of infestation, it is essential to remove the dead trees and trees in advanced stage of infestation at least once in 6 months.

Dead trees and trees beyond recovery - trees having yellow canopy and /or more than 50 per cent bark circumference damage needs to be uprooted.

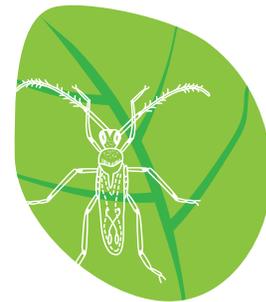
Pest stages occurring in the roots should be destroyed so as to reduce pest inoculums in the future.

13.1 Tea Mosquito Bug (*Helopaltis antoni*)

Tea mosquito is a major pest of cashew and causes more economic loss to the crop than other pests.

The adults and nymphs suck sap from tender shoots, leaves, floral branches, developing nuts and apples. The infested leaves wrinkle and dry. Tea mosquito causes crop loss to the extent of 30 - 40%.

The pest can be controlled by spraying 0.05% Monocrotophos, 0.1% Carbaryl, at the time of vegetative flush, the second spray at the time of pinnacle emergence and the third at the time of fruit setting.



Helopaltis Antoni

13.2 Stem Borer (*Plocaederus ferrugineus*)

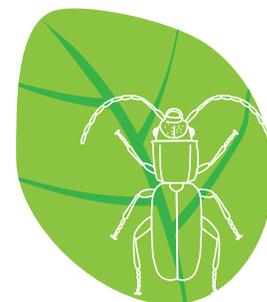
Stem borer is a dreaded enemy of cashew causing death of the affected tree. The incidence of the pest was about 10%.

For the control of stem and root borer early detection of incidence is very important.

The earlier attack is detected the more are the chances of effective control.

Dead trees and those which are beyond recovery should be removed from the plantation.

The affected bark should be removed along with the grubs and then swabbing with Lindane solution is done. The treatment cutting trees at prophylactic treatment for stem and root borer.

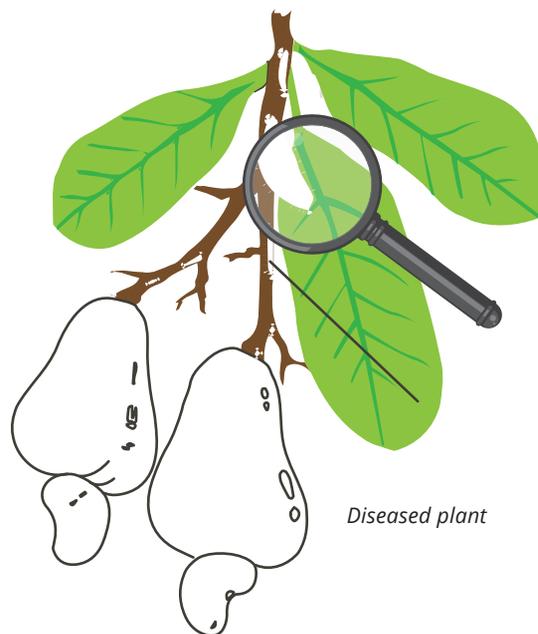


Plocaederus Ferrugineus

13.3 Die Back or Pink Disease

Disease is caused by *Corticium salmonicolor*. The affected branches initially, show white patches on the bark and a film of silky thread mycelium develops on the branches during monsoon. Later, fungus develops pinkish growth. In due course, the bark splits and peels off and the affected shoots starts drying up from the tip.

This disease can be controlled by the pruning of the affected branches below the spot of infection and destroying them, protecting the cut surface by application of Bordeaux paste and spraying of Bordeaux mixture 1% twice in May - June before the onset of South West monsoon and the second in October.



13.4 Damping Off of Seedling

The disease occurs under conditions of poor drainage in the nursery. It is caused due to *Pusarium* sp, *Pythium* sp, *Phytophthora palmivora* and *Cylindrocladium scoparium*. The fungi attack either on the root or the collar region or both of the seedlings.

It can be controlled by provision of adequate drainage in the nursery and drenching the beds/polybags with 0.1 % Cersan, Bordeaux mixture 1%, Diathane - M-45 0.25% or Feltef 0.1%.

13.5 Stem and root borer (*Plocaederus ferrugineus*)

Among the numerous insect pests infesting cashew, stem and root borer, *Plocaederus ferrugineus* L. is the most dreaded one since its infestation results in the death of the tree with 12 years of infestation.

Grubs bore into the bark in their early stages and make excessive tunnels in all directions causing wilting of branches and then the tree as a whole. Roots are also affected. Plantation over 15 years are often seen infested.

13.5.1 Orchard Management to overcome stem borer infestation

- Undertake periodical cleaning of collar region, removal of grubs, pupae and eggs and inter ploughing wherever possible during monsoon months.
- Uproot and remove dead trees from the plantation
- Avoid injury to the trunk or exposed portion of the root.
- Swab with kerosene - coal tar mixture (1:2) up to one meter height on the trunk and on exposed bark after shaving the infested bark to prevent egg laying.
- Carry out root-feeding with monocrotophos (10 ml) + water (10 ml) in a small polythene bag twice a year on both sides of the trunk.

14.0 Harvest and post-harvest management

In Andhra Pradesh, cashew starts flowering from January /February and fruits starts maturing from April /May. The producer has to follow the following step to have quality harvest

- Not pluck the fruits from the tree
- Let the fruit mature and drop on the ground
- Keep your ground beneath the tree clean so that picking will be easy
- Remove the seed from the fruit and collect only the full mature seeds
- The fruits can be used raw or used as compost
- All the health collected nuts should be dried for 2-3 days to bring down the moisture level to 12-16%
- The dried seeds should be packed in air tight gunny and stored for sale

15.0 Crop Calendar

The crop calendar is annexed I

16.0 Farm Diary

Farm Diary will help to monitor field operations it will also determine the success of interventions and help farmers to record their field activities along with farm production and income the sample diary is provided below. The template is annexed II.

17.0 Cost of Cashewnut Production

ITEM OF EXPENDITURE	COST PER YEAR PER AC					Total
	Year 1	2	3	4	5	
1. Land Preparation	1600	0	0	0	0	1600
2. Digging of pits and filling	3,200	320	0	0	0	3520
3. Planting Material	8,000	800	0	0	0	8800
4. Planting - Staking	4,000	400	0	0	0	4400
5. Live Hedge	12,000	0	0	0	0	12000
6. Manures and Fertilizers	1200	1,200	1,320	2,400	2,880	9000
7. Plant Protection	1200	1200	1,320	2,400	2,880	9000
8. Irrigation	4000	4,000	0	0	0	8000
9. Intercultural operation	600	660	2400	2400	3600	9660
10. Trenching			1200	1200	1200	3600
11. Mulching			1600	1600	1600	4800
12. Harvesting	0	0	800	1600	4000	6400
13. Drying			400	600	1200	2200
14. packing			40	80	400	520
15. Storage			40	80	400	520
16. Miscellaneous	1000	500	500	500	500	3000
Total	36,800	9,080	9,620	12,860	18,660	87020
Yield/AC in kg	0	0	80	240	480	
Price per kg			130	135	140	
Sale			10,400	32,400	67,200	
Yearly surplus	(36,800)	(9,080)	780	19,540	48,540	
		(45,880)	(45,100)	(25,560)	22,980	

From 6th year onward one plant may yield 10-12 kg of nuts per year.

Annexure I: Crop Calendar

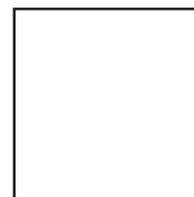
ACTIVITIES	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Nursery / Graft		█	█	█								
Pit Digging												█
Planting	█											
Trench												█
Compost preparation	█											
Nutrient Application		█			█							
Weeding			█		█							
Pruning		█										
Intercropping	█					█			█			
Irrigation					█	█						
Yield Estimation							█		█			
Harvesting										█	█	█
Drying											█	█
Plant Protection								█	█			

Annexure II: Farm Diary

MEMBER'S INFORMATION

Name:

Code No:



Village:

Hamlet:

.....
Signature of Field Officer

Place:
Date:

.....
Signature of Farmer

Place:
Date:

FARMER'S AGREEMENT

Farmer's Name & Address:

Farmer's Code :

With this I declare that

1. I am ready to work with FPO for production of organic cashews.
2. Farming will be done as per the standards and methods guided by SoP.
3. No use of banned substances and chemicals.
4. I will attend every farmer training programme arranged by FPOs and supporting agency and clear my doubts or complaints.
5. I will follow minutes of meetings conducted for crop management.
6. I will maintain daily records of practices on fields in this diary.
7. I will follow the instructions given by FPO and supporting agencies
8. I will supply raw cashew nuts according to needs and demands of FPO.
9. I will store and transport the produce according to the standards.
10. If any problem arises in the orchard I will contact the FPO and supporting agencies.
11. I will follow the procedure as provided by the FPO and supporting agency for clearance of complaints.
12. I will allow the FPO staffs, staffs of supporting agencies and government officers, access to all my fields, Storage premises & related documents.

I will follow the above mentioned aspects thoroughly.

.....
Farmer's Signature

Name:

Date:

Place:

.....
ICS Manager's Signature

Name:

Date:

Place:

Inspection form

JANUARY 18			FEBRUARY 18		
Date	Activity	Sign	Date	Activity	Sign
MARCH 18			APRIL 18		
Date	Activity	Sign	Date	Activity	Sign
MAY 18			JUNE 18		
Date	Activity	Sign	Date	Activity	Sign
JULY 18			REMARKS OF INSPECTION		
Date	Activity	Sign			

AUGUST 18			SEPTEMBER 18		
Date	Activity	Sign	Date	Activity	Sign
OCTOBER 18			NOVEMBER 18		
Date	Activity	Sign	Date	Activity	Sign
DECEMBER 18			JUNE 18		
Date	Activity	Sign	Date	Activity	Sign

Harvest & Sale Details

DATE	SALE TO FPO			SALE TO OTHERS			TOTAL	REMARKS
	Quantity	Rate	Amount	Quantity	Rate	Amount		
2017								
TOTAL								
2018								
TOTAL								
2019								
TOTAL								
2020								
TOTAL								

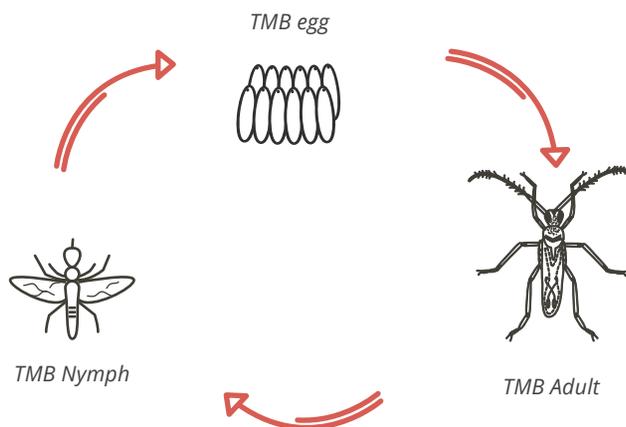
CASHEW PLANT PROTECTION

Number of Pests are observed on cashew plantations, predominantly Tea Mosquito Bug and Cashew Stem Borer are responsible for affecting yields of cashew plantations. While stem borer attacks are observed throughout year, Tea mosquito bug attacks during particular stages new shoots come, inflorescence stage and fruit setting stage.



1. Tea Mosquito Bug (TMB) and its management

Damage: The damage by the pest to cashew plants starts with the process of egg laying. The nymphs and the adults of this pest target terminal branches, buds and leaves by injecting toxic substances in plant parts and suck sap. The pest can reduce the yield drastically in shorter duration. Estimated losses due to TMB are 40%. However, yield loss from a plant can go up to 100%



Symptoms:

Leaves : Red / brown lesions, curled up and deformed. Shoots, leaves and inflorescence: Reddish brown spots. Eventually will dry up leading to total loss of the crop.

Occurance: October - April

Control Measures

Chemical:

During new flush (october):

Monocrotophos 5 ml/ 1lit

Fruit and nut development stage (February): Lambda cyhalothrin 3ml / 10lit. Spraying of insecticides should be started from the periphery of the infested plantations to trap the migratory and escaping population.

Trap crop:

Cultivate Annatto (*Bixa orellana*) (Telugu: Konda Gagu) as trap crop on the contours of the plantation.

Manual control:

Monitor the pest in the field at regular interval. Collect the nymphs and adults by using hand nets at twilight hours. Removal of weed bushes from the plantation which provide moist and warm atmosphere to the insect.

Organic Control:

Neemastra (Neem oil at 5ml / 1lit) to be sprayed at 15 days interval.

Dashparni Ark can be effectively used to control TMB with spray of 15 days interval during infestation period. Both the pesticides are recommended by TNAU. The Detail process of Dashaparni Ark is also provided in the leaflet.

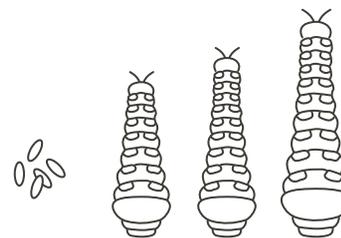
2. Cashew Stem Borer and its Management:

Cashew stem borer is widely present cashew pest and can be found in all the cashew cultivating regions of the country. Plantations over 15 years are more susceptible to infestations. The recorded rate of infestation is 5 -10% in older orchards, meaning 8 trees per acre. Clearly stem borer is one of the major cause of yield losses.

Damage:

The adults lay eggs in loose bark of tree branches of tree trunk, after hatching in 4-6 days larvae bore holes in the trunk and bore down to roots. The sap and excretion start becoming visible at the base of the stem.

Reduces the yield by 30% and loss of attacked plant in 1 - 3 years depending on level of infestation.



Eggs and Larval stages of cashew stem borer

Symptoms:

Openings of bored holes are plugged with reddish mass of chewed fibre and excreta with exuding sap at the base of the stem. The infested tree leaves turn yellow, twigs dry up and plants wilts in 1 to 3 years.

Occurrence: Throughout year but appearance is more observed in October – April.

Control Measures

Chemical Control:

Swabbing of tree trunk with coal tar and kerosene (1:2) twice in year during March and November.

Root feeding: Monocrotophos at 20ml / tree once infestation is observed in orchard.

Training:

Train the newly planted grafts to bear branches at a height of 1 metre above ground level.

Light traps:

Use light trap at the rate of one per hectare to attract the pest.

Manual control:

Locate loose bark and boreholes and spike out eggs and grubs and kill them periodically. Survey the plantations during fruiting season (January - March) and eradicate severely infested trees.

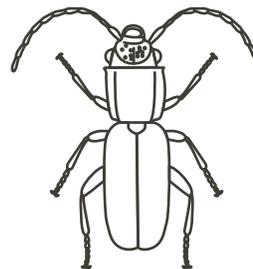
Organic Control:

Use of parasite fungus along with neem cake are found to be most effective in . *M. anisopliae* spawn 250g/tree + 500g neem cake. Even *B. bassiana* spawn 250g/tree + 500g neem cake can reduce the infestation up to 4 trees per acre.

Organic control is more effective in stem borer than chemical control.

Integrated Pest Management

Following The Integrated Pest Management (IPM), combination of different pest control techniques can be used. This reduces the overall cost of cultivation, limits the over usage of chemicals and reduces their further footprints in food. IPM also helps in contouring pests ability to adapt to particular method of control.



Cashew Stem borer adult

Thank You

