ARECANUT CULTIVATION UNDER MICRO IRRIGATION

Jain Irrigation Systems Ltd.
Jalgaon

पाणी हेच जीवन ... *Water is life...* *जल ही जीवन..*

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***Disclaimer :** The package of practices given in this booklet is based on limited experimental data and need not be applicable to all arecanut growing areas.Therefore, the company does not guarantee the production levels mentioned here in every location where the package is adopted.

Jain Group

Started as a trading Company in 1963 by its first generation entrepreneur, Shri. Bhavarlalji Jain, Chairman, Jain Group, Jalgaon, it rapidly grew into a medium size multi national Company within a relatively short span through sheer dint of invincible determination and fanatical dedication. The group in the last 17 years achieved an annual turn over of Rs. 4000 millions (1997-99) mainly from its flagship Company namely Jain Irrigation Systems Ltd. of which export constituted Rs. 1000 millions. The group today is the largest processor of plastics in India annually processing 55,000 MT of different polymers into finished products predominantly used in agriculture & water supply apart from irrigation, industrial and construction use.

Jain Irrigation Systems Ltd., are pioneers and market leaders in Micro Irrigation Industry in the country today, having covered over 4.5 lac acres of land under Drip Irrigation covering over 45 different types of crops. The Company manufactures diverse ranges of micro irrigation system components and sprinkler irrigation systems suited for specific soil / water and agroclimatic conditions. In order to promote hi-tech agricultural activities, the Company diversified its activities into other hi-tech agro related forays like Tissue Cultured Plants, Green House Constructions, Water Soluble Solid / Liquid Fertilizers, Bio-Pesticides & Bio-Fertilizers. The Company is also into manufacture of Solar Water Heating Systems for conservation of conventional energy, medium density Polyethylene for Gas Conduit apart from other wood substitute products like PVC Door / Window Profiles for building construction and PVC / Polycarbonate / Acrylic Sheets for various applications - all these in collaborations or joint ventures with world leaders in related fields.

The Company, today is totally equipped to develop, virtually from concept to commissioning micro irrigation projects on any type and size of land anywhere within the country or abroad. All jobs are taken up on turn key basis, completed and handed over on a time bound schedule.

Jain Irrigation Systems Ltd., as the second largest manufacturer and exporter of Papain in the world and number one manufacturer and supplier of PVC Pipes in India is also the only established manufacturer / exporter of innovative Casing and Screen Pipes. In their latest diversification, a food processing plant - the largest in Asia with a capacity of 120 MT per day, the first phase of Dehydration of Onions and Vegetables Project and Fruit Processing Project is already gone on stream. Jain Irrigation Systems in its Research and Development facility spanning over 1000 acres of land - the only one R & D farm recognized by the Government of India in the private sector for agriculture related activities, experiments on various agronomic and irrigation practices in line with International paradigms is an ongoing process.

In recognition of our outstanding R&D efforts in the field of agriculture, water management and its contribution to the farm and farmer, the Company has been honoured with several prestigious national and international awards for their outstanding contribution in this field. **The latest is the honour conferred on our chairman by Irrigation Association of USA by bestowing the CRAWFORD REID MEMORIAL AWARD for "his significant achievements in promoting proper irrigation techniques and fostering major advancements in the industry outside the United States".**

The Group's contribution in export thrust has been equally commendable. The Group is into export activities into all the six continents covering over 30 countries all over the world. New markets are being explored for increasing the export performance and earning FOREX from hard currency areas. In recognition of their export activities, they have been honoured with several export promotion awards by the Government of India year after year.

In order to compete with the international market in terms of quality, the Sheet Division and Papain Division of Jain Irrigation System have got accreditation of ISO 9001 from RWTUV, Germany. Similar process is on for covering most of our products under this world standard.

STATUS

The arecanut palm (Areca catechu L.) is the source of the common masticatory nut, popularly known as betel nut or Supari. In India, it is extensively used by all sections of people as a masticatory and for several religious and social ceremonies. In fact, India is the largest producer of arecanut in the world. It occupies a prominent place among the cultivated crops in the states of Kerala, Karnataka, Assam, Meghalaya, Tamilnadu and West Bengal. India is also the largest consumer of arecanut. The area under arecanut is estimated to be 2.6 lakh ha yielding about 3.13 lakh tones of processed nuts. Karnataka accounts for nearly 40% of the total arecanut production; Kerala 25% and Assam 20% and the rest of the area is distributed in other states.

It is estimated that about 85% of the area under arecanut are owned by small and marginal farmers.

Area under Arecanut in India

State	Area lakh ha	Production lakh MT	Productivity Kg/ha
Karnataka	0.88	1.28	1455
Kerala	0.73	0.80	1096
Assam	0.74	0.64	865
Others	0.29	0.41	--
All India	2.64	3.13	1186

In Karnataka, the cultivation of arecanut has spread from traditional Dakshin Kannada, Shimoga and Chitradurga to Mysore, Kolar, Tumkur,

and Dharwad. Of the 1.28 lakh MT arecanut produced, Dakshin Karnataka accounts for 37.5%, Uttar Karnataka 35% , Shimoga 15% and Chikmaglur 12.5%.

SOIL

Arecanut is essentially a garden land crop. The largest area under the crop is found in gravelly laterite soils of red clay type. It is also grown in the clay loamy soils. Actually, the deep black fertile clay loam in the tank irrigated area supports luxuriant tree growth. The sticky clay, sandy, alluvial and calcareous soils are not favourable for arecanut cultivation. The pH of the soil should be slightly acidic to neutral. Lime should be added if the soil pH goes below 5.0.

The soil should be deep (1.5m) and well-drained. The palm does not withstand either drought or water stagnation.

ALTITUDE

The altitude at which areca palm grows depends to some extent on the lattitude. In the North-Eastern regions of India (Assam, W. Bengal) it is grown on the plains because at higher elevation the winter temperature would be too extreme for the crop. Though the palm can be grown upto 1000m above sea level, at higher altitude the quality of the fruit is not good. For example, in Wynad (Kerala) & Coorg (Karnataka) the endosperm (Kernel) of the fruit does not develop sufficient hardness.

AGROCLIMATE

Arecanut flourishes well in tracts with very high rainfall such as Malnad of Karnataka (=4500 mm) as well as the low rainfall areas like the

Maidan of Karnataka (=750mm). In areas where there is prolonged dry spell, the palm requires irrigation.

Temperature : Arecanut grows in areas with a wide range of temperature from a minimum of 4 ^{0} C (eg. Mohitnagar, West Bengal) to maxiumum of 40 ^{0}C (Vittala in Karnataka & Kannara in Kerala). However the palm fluorishes well in a temperature range of 25 to 35 ^{0} C. Diurnal fluctuations of temperatures of over 5 ^{0} C with low humidity can cause severe foliage damage.

Relative Humidity : A range of humidity from 70 to 95% is found ideal for Areca growth.

The following table shows the approximate climatic conditions prevailing in the west coast belt of India where Arecanut grows well.

Month	Rainfall mm	Diurnal Temp. difference ^{0}C	Max. temp.. ^{0} C	RH%
January	-	10.8	31.7	85.0
February	-	9.5	31.2	89.3
March	-	8.2	31.8	86.5
April	28.7	4.5	30.8	88.0
May	128.3	6.5	32.4	90.5
June	1020.8	5.3	29.3	95.3
July	1227.9	5.8	29.3	94.5
August	728.2	4.9	28.4	96.5
September	333.4	5.4	28.7	94.5
October	197.3	6.7	30.2	93.0
November	76.2	9.3	31.8	90.5
December	13.6	10.8	32.2	84.5

THE ARECA PALM TREE

The name Areca was derived from a Malayan word meaning "Cluster of Nuts". Taxonomically, this tree belongs to Palmae family under the tribe Areccae and the genus Areca contain about 76 species. Among these *A .catechu* is the only cultivated species.

The stem is erect, smooth green in the upper portion and greyish brown in the lower portion. Leaves are pinnate, base of the petiole expanding into a smooth sheath. Leaflets are thin often confluent, with several mid ribs, attached to the rachis in a vertical line.

The inflorencence is a spadix, and androgynous. Male flowers are many, minute occupying the upper portion of the spikes. Female flowers are larger and few located at the base of the spikes. Fruits are ovoid or oblong supported by a persistant perianth. The fruit has a fibrous mesocrop, and seeds are with a truncate base, endosperm deeply ruminate with a basalar embryo.

The root system : Areca palm has an adventitious root system, typical of monocots. The first root is formed from the pro-stem of a germinating nut, earlier to the development of the first leaf. This takes place in about 30 days after sowing. At this stage the root is about 0.6 cm in length. Within 20 days more roots are produced. Rootlets of various sizes are formed in about 90 days after sowing.

A fully grownup base of the palm will have 10-12 rows of roots which correspond to the number of leaves shed within the first three years of growth. The root producing zone, with an inverted cone shape is about 28 cm in length and 23 cm in diameter and is termed as `bole'. In older

palms the bole starts decaying from the apex and extends upwards.

The root tip is protected by a very prominent root cap. The absorbing zone of the growing root is located just behind the root cap and is white in colour.

In arecanut the vertical penetration capacity of the roots into soil is rather low and most of the roots spread laterally. The main roots extend upto 2 m length with a uniform thickness ranging from 9 to 18 mm. The mainroots produce laterals which further branch profusely.

Several short conical, flower like out - growths are found all over the roots. These increase in number as the tree grows older. They are pneumatophores, assisting in the absorption of air. They enable the root tip buried under water or in marshy soil to have contact with the atmosphere.

The number of roots present in a palm depend on its age. A ten year old tree will have 175 roots, 35 year tree 385 and a 60 year tree will have 78 roots. The maximum roots in a middle age palm is within the first 60 cm depth and within a radius of 60 cm from the palm.

ARECA VARIETIES

Indigenous areca varieties are all tall and low yielding. The research on areca crop has resulted in the development of technologies for increasing production and productivity. India became self sufficient in arceanut in the seventies.

Four high yielding varieties of arecanut were released so far from the Central Plantation Crops Research Institute (CPCRI), Regional station,

Vittal. They are Mangla (Semi tall & early); Sumangla (tall); Sreemangla (tall) and Mohitnagar (tall) with yields of 3.0, 3.2, 3.18 and 3.67 kg. chali per palm. Another variety - SAS-1 - has been released from the University of Agricutural sciences, Dharwad with a yield of 4.60 kg. chalis / palm.

One of the major constraints in areca cultivation, is the height of the palm which makes spraying and harvesting difficult. In order to overcome this, the natural dwarf mutant of Hirehalli Dwarf is exploited to produce crop combinations of this variety with high yielding varieties such as Sumangala, Mangla, Sree Mangla and Mohitnagar. The hybrids from these crosses were found to have early bearing and high yield, but with a smaller canopy size, hence a reduction in plant spacing is possible.

PLANTING MATERIAL

Arecanut is an exclusively seed propagated crop. Mother palm should be early bearers with high percentage of fruit set and more than ten years old. From these palms, fully ripe and heavier (>35 g) nuts are selected. Similarly selection of proper techniques for germination and raising seedlings are very important.

For obtaining good germination, the seednuts are sown as whole fruits. Under Vittal conditions the germination takes 53 days. Sowing nuts immediately after harvest in soil or sand and watering once in two days result in early and good germination. Nuts are sown vertical in position with the calyx end just covered by sand. Sprouts in such primary nursery are retained for about six months. Young seedlings with two or three leaves are transplanted to secondary nursery beds. Seedlings planted at wider spacing of 45 cm are more vigorous in the secondary nursery.

Seedlings from primary nursery can also be planted in polybags for the secondary stage. Partial shading of the nursery by coconut leaves is essential for survival of the seedlings. Live shades are also provided by planting shade trees - Sesbania or Crotalaria.

A basal dose of decomposed FYM at 5 tons /ha is added to the secondary nursery with the onset of monsoon, The nursery is to be irrigated during summer months. Periodical weeding and mulching are also required.

PLANTING IN THE MAIN FIELD

Planting in the mainfield is done with 12 or 18 month old seedlings. Seedlings with maximum leaves and minimum height are the best for field planting. The cumulative yield of nuts from plants raised from one or two year old seedlings is always high.

Arecanut thrives best in humid areas protected against hot sun burn and heavy wind. The site selected should have adequate irrigation facility during the dry weather period. The soil should be deep to ensure well developed root system.

Planting should be done in May - June in well drained soils and August - September in clay soils prone to waterlogging. The rows should be in North - South direction to reduce sun -scorching.

The plant spacing at 2.7 x 2.7 m is found to be most suitable, in Vittal conditions. The study on the distribution of roots under different densities of planting when considered along with the yield of individual palms indicates that a spacing of 2.7 x 2.7 m will be optimum for areca palms.

Planting is done in pits of 90x90x90 cm filled upto 50 cm with top soil,

cowdung, sand and 500 g SSP. Usually seedlings are planted deep (30-60 cm) to induce good anchorage and a large volume of soil to facilitate the spread of the roots. As practised in Malnad,Karnataka where planting deep is not practical, seedlings are planted in shallow pits and mounds are raised at the base.

During the hot weather period the young seedlings must be protected against direct exposure to sun by providing artificial shade or by raising a shade crop of banana.

AGRONOMY

The cultural practices adopted varies depending upon the soil type and rainfall of the locations. However, with the advanced agrotechniques some of these requirements are standardised. Thus plant spacing of 2.7 x 2.7 m was found to be most appropriate for high yield and quality. This will give a plant population of 1370/ha.

The fertiliser requirement is also standardised based on a series of field trials in Vittal , Hirehalli, Peechi, Mohitnagar and Kahikuchi by the Central and Regional Arecanut Research Stations. A fertiliser dose of 100:40:140 g of N, P_2O_5 and K_2O with 20 kg FYM or 12 kg green leaves and 12 kg compost per tree was found to be optimum for bearing palms. Fertilisers are applied in basins around the palm dug to a depth of 15-20 cm and 0.5-1.0 m radius leaving 20 cm from the base of the palm. After this application soil is rolled up and covered with organic matter (compost / green leaves) and soil. Interestingly applications of fertilisers in split doses in March - April and September-October did not show any significant effect on yield (in Central Kerala conditions).

During the first and second year after planting only 1/3 and 2/3 of the chemical fertilizers, respectively and full dose of green manure and cattle manure are to be applied.

The timing of fertiliser applications can be shifted to April - May in irrigated conditions.

Response of high yielding varieties to fertiliser levels have shown that doubling the recomended dosage can increase the yield.

Irrigation Areca palm is sensitive to drought. Therefore irrigation is essential in areas with long dry spells. In places with high sub-soil moisture and in areas where the rainfall is fairly uniform and well distributed, the crop is grown totally rainfed as in West Bengal, Assam, Northern and Southern parts of Kerala. However in the Central part of Kerala and all parts of Karnataka, areca gardens are irrigated. This is especially so in the Dakshin Karnataka district where arecanut is cultivated extensively and the dry weather extends from mid November to May. Similarly even in traditionally, non irrigated areas (like southern Kerala) irrigating areca gardens have proved to be extremely beneficial (eg. Palode).

The traditional irrigation methods follow an irrigation once every 7 days during November - December, every 6 days during January - February & every 4 days during March - May. At each irrigation, 175 litres / palm is applied. Irrigation scheduling worked out at Vittal, Karnataka were based on cumulative potential evaporations (CPE) for the season. Their studies showed that an irrigation of 30 mm depth when CPE is 30 mm is optimum. However, under circumstances when water supply is critical, scheduling with 30 mm water for 60 mm CPE was also found to be beneficial.

In the study on irrigation requirments of Arecanut, Khader et al. (1985) clearly showed that for higher return, it is imperative to irrigate areca palms at closer intervals. Though the cost of irrigation is more when the frequency of irrigation is increased to 5 days the ultimate cost - benefit ratio (3.1) is more in the palms irrigated at closer intervals . In the palms which received irrigation once in 20 days, instead, have a cost benefit ratio of 0.19 only. This study also brings out that the beneficial influences of other inputs will not be expressed if the irrigation is limited.

In traditional systems, the water source was the tank located at the head of the garden from where water was guided by gravitational flow. Later, lift irrigtion from wells and rivers came into practice. Irrigation in majority of the gardens is done by splashing water into the tree basin from the conveyance channel. However, from the 80's overhead sprinkler irrigation is adopted in many gardens. Lately these also have been replaced by drip irrigation in Mangalore, Karwar and Shimoga districts.

DRIP IRRIGATION

Drip irrigation systems was tried at Vittal during 1978 - 80 by Khader on areca palm. He reported that drip system improved the soil water regime by minimising the fluctuations in the soil water content, minimised weed growth and increased yield significantly.

Adoption of drip irrigation mitigates the loss of water (upto 65%) through conveyance which occurs normally in flood irrigation. Drip irrigation also avoids excessive wetting of the root zone which is detrimental to the areca palm.

Drawbacks of conventional method of irrigation

1. Wastage of water during conveyance, due to seepage and evaporation.
2. Temporary waterlogging at the time of water application.
3. Soil water is maintained in a cyclic pattern with excess water in the beginning and deficit water at the end. Such cycles will induce water stress periodically in the palm.
4. Excessive use of power (energy for pumping), time and labour all of which increases the cost factor per irigation.

Fertigation Inorganic fertilisers can be given through drip irrigation once the system is installed in the garden. The fertiliser application is achieved more uniformly, at required concentrations to each palm. The method saves upto 30% of the dose of fertiliser and saves time, labour and cost of fertiliser aplication while improving yield and quality. We recommend a dose of 80:40:40 NPK for fertigations. This should be applied either as a daily dosage or on alternate days. Our recommendations are as follows :

Duration of applications	Grade	Total Qty. Kg/ Acre	Kg/day/Acre
Start fertigation from	19:19:19	53	0.610
August to Oct.(90 days)	+ Urea	54	0.610
Nov. to Dec.	19:19:19	53	0.885
(60 days)	+ Urea	33	0.550
Jan. to Feb	19:19:19	105	1.754

The water soluble fertiliser, 19:19:19 is acidic in nature and contains micronutrients suitable for arecanut. The amount of nutrients can be adjusted as per age of the palm and requirement of the crop. Because of the acidic nature it keeps the drip system also clear of any clogging.

ADVANTAGES OF MICRO IRRIGATION

Drip Installed under a young Arecanut Plant.

1. Saving of water - upto 70%
2. Increase in yields upto 30%.
3. Improves the quality of the produce
4. Savings in energy, time, and labour
5. Light soils can be cultivated
6. Lesser problem with weeds

7. Saline, alkaline and other problem soils can be brought under cultivation.
8. Undulating terrain and slopes can be cultivated with drip irrigation.
9. Water soluble fertilisers can be given through the drip system.
10. Early maturity is achieved through the adoption of drip irrigation.

    (while fruiting occurs at 7th year in flood irrigated areca palm, by drip irrigating it was advanced to the 5th year)
11. More intercrops are possible in the Areca garden.

Initially two 8 LPH drippers are provided per palm to irrigate 16 litres / day / plant. If intercrops or mixed crop of pepper or betel vine are present, the water delivery is adjusted to meet the demand of those crops also. From the 10th year onwards an additional dripper (8 LPH) is added per palm.

Drip Installed under a Arecanut Tree

Water Requirement of Arecanut (l/day/ palm)
(spacing 2.7 m x 2.7 m)

Months	I Year	II Year	III Year	IV Year	V Year onwards
July	6	8	11	14	18
August	7	10	14	18	22
September	8	12	17	20	25
October	9	13	18	23	28
November	9	12	17	20	28
December	10	13	18	24	30
January	9	12	17	24	27
February	10	14	20	26	30
March	12	16	22	28	34
April	12	16	22	28	34
May	14	18	24	30	40
June	10	14	20	26	32

The above table provides only a guideline. PWR can be changed as per soil, climatic conditions and age of the crop and the type of intercrop in the garden.

INTERCROP AND MIXED CROP

Arecanut, with its tall growing habit and single stem trait provides inmmence scope for intensification of cropping systems, which can help the natural ecosystem in its diversity and biological stability. Additionally,

the possibility of inter / companion crop enhances the farm income as well.

The initial period of five to six years is ideal for short duration crops while shade tolerant tree species can be grown as mixed crops later. Thus areca palm offers opportunities for temporal and spatial distributions of inter / companion crops, eg. Cocoa (Theobroma cacao) is grown as a mixed crop in arecanut gardens.

Approximately 30-50% light is transmitted through the arecanut canopy. Fortunately for intercrops, more than 85% of areca roots are within 60-80 cm radius from the base of palms spaced at 2.7 x 2.7 m. Thus Areca exploits only 2.27 m2 of land area out of 7.29 m2 i.e. about 68.7% land is still available for utilization by the companion crops.

A variety of crops are grown as inter crop in areca gardens. Some of these are Arrow root, Banana, Paddy, Groundnut, Tapioca, Sweet potato, Pine apple and Ginger.

Black pepper or betelvine are mix cropped and allowed to tread on the areca stems. When this is done the quantities of manure and fertilizer per tree are generally doubled. Experimental data from such mixed crop systems for a period of 10 years have shown that there was no significant detrimental effect on the yield of areca palms due to training of black pepper on them. Further it helped to augument the net income of the farmer by about Rs.10,000 / ha from black pepper alone.

Apart from increasing the production of additional crops and employment potential, multiple cropping system can act as a social security against instability of yield and crop loss also.

PEST AND DISEASES

The following descriptions consider only the major pests and diseases which cause substantial yield reductions in areca palm.

a] Pests	**Control measure**
White mite (Oligonychus indicus**)** Redmite (Raoiella indica) They are sucking pests; suck sap from the green portion of the plant. Yellowish speckls form on the leaves, finally leading to leaf withering.	Spraying of dicofol (Kelthane) 2 ml/lit. formothion on dimethoate 1.5 ml/lit Repeat spraying at an interval of 15-20 days if there is recurrence of pest.
2. Spindle bug (Crvalhoia arecae) They form colonies in the top most leaf axils. Suck sap from the tender spindle and leaves. Infested portions develop necrotic patches, which later dry up. Spindle fails to open. Severe infection leads to stunting of the palm.	Placement of 2g phorate in perforated polybags in the innermost leaf axils of palms during April is effective. As new leaves emerge polybags are to be shifted to the innermost leaf axils.
3. Root grub (Leucopholis burmeistri) The root grubs or white grubs feed on roots and are polyphagous in nature. Grubs thrive in moist soils. The incidence is more in ill-drained and low lying clayey soils. The grubs feed on tender roots. When all the roots are destroyed the palm will lose its grip on the soil and it well be toppled down. Visual symptoms include drooping and complete drying of the leaves.	Phorate applied @ 15 g/palm gives effective control of the pest. Apply phorate to the soil around the plant twice a year. Repeat the treatment for 2-3 years continuously. Collect the adult beetles in the evenings after the premonsoon showers and kill them.
4. Tender nut drop caused by Halyomorpha marmorea	Spray endosulfan, 0.05% to the bunches of the affected palm and the neighbouring palms.

Diseases	Control measures
1. Koleroga or Mahali (Phytophthora arecae) Most dreaded disease of areca palm in high rainfall areas. Annual crop loss upto 75%. Rotting and excessive shedding of immature nuts.	Spray Bordeaux mixture, 1% to the bunches at least two times at an interval of 40-45 days. The first spray should be given immediately after the first monsoon showers. Collect all infested nuts and destroy.
2. Budrot (Phytophthora arecae) Discoloration of the spindle is the first symptom. Infection spreads to young leaves and they rot rapidly. Later the growing point of the stems rot resulting in the death of the palm.	Remove the infected tissue completely and treat the wound with Bordeaux paste. Spray Bordeaux mixture (1%) to the crown of healthy palms in the neighbourhood. Remove koleroga affected bunches and destroy them.
3. Inflorescence dieback & button shedding. (Colletotrichium glocosporioides) Disease appears first on the rachillae and main rachis causing its wilting. Female flowers of the infected rachii are shed. Severe infection results in inflorescence die-back.	Spray Indofil, M-45 @ 3 g/l at the time of opening of female flowers. A second spray should be given 20-25 days after the first. Remove the fully affected inflorescence and destroy by burning.

4. Anabe roga or foot rot

(Ganoderma lucidum)

Occurs in neglected, ill-drained and overcrowded gardens. Primarily soil-borne desease but spreads through air-borne spores.

Symptoms include discoloration of leaves, later drooping of leaves. Development of inflorescence and nuts arrested. The roots become brittle, discolored and dried. The central tissue of the affected portion of the stem base become dark brown and emit a musty smell. Because of the invasion of the fungus to the xylem, water supply to the top is impeded resulting in pathological drought and death of the infected palm.

Proper management of the garden is the best way to check the occurrence of the disease. Improve drainage.

Drench the root zone of the affected palm with 0.3% Calixin at quarterly intervals. Apply 2-2.5 kg neem cake per palm per year.

Phytosanitary measures like cutting and burning of the dead palms along with bole and roots should be followed strictly.

5. Yellow leaf disease (YLD)

(A number of fungi and bacteria)

It is a serious malady. Reduction in yield due to the disease was reported upto 50%. The symptoms include yellowing of the leaves and shedding of both mature and immature nuts. The endosperm of the diseased nut turns black and become unfit for consumption.

The disease is not amenable to control by conventional plant protection measures. Removal of diseased palms is one of the management strategy in mildly affected areas.

HARVESTING AND PROCESSING

Harvesting of nuts at correct stages is very important for obtaining the produce of better quality. In Chali preparation only ripe fruits are harvested. The yield ranges from 800 - 1400 kg/ha.

After harvesting, the ripe nuts have to be sun dried for about 40-45 days. Proper drying of the nuts is important to prevent fungal infection of the nuts.

If the requirement of the market is tender processed nuts, then harvesting green fruits at an appropriate stage of about 6 months maturity is essential.

CASE STUDIES OF DRIP IRRIGATION IN ARECA NUT

CASE STUDY 1

Farmer	:	Shri. B.M. Sundresh P.O. Abbalagere, Shimoga - 577 201, Karnataka.

Crop details

Crop	:	Arecanut, Coffee and Banana
Soil	:	Black clay
Area	:	4 acres
Planting pattern	:	Mixed crop
Age of crops	:	2 years for all crops
Arecanut spacing	:	9' x 9'

System details

Drip system was installed for all crops.

Areca	:	20 l/plant/day till 4th year, 30 l/plant/day, from 5th year
Coffee	:	6 l/plant/day
Banana	:	30 l/plant/day
Operation	:	4 hrs./day
Source	:	borewell with 5HP submersible pump.

Farmers perception on the benefits of drip system

1. Areca growth has increased by 50% compared to flood irrigation
2. Because of drip system he can now irrigate all the crops with the available water.
3. It has reduced his power bill, labour use for weeding and drainage formation.
4. Drip system has helped him to have more inter crops and fence crops of Teak and silver oaks.
5. He now needs only one labour to irrigate the whole 2 acre.
6. The maintenance expenditure for the farm has come down by 70%.

CASE STUDY 2

Farmer	:	Shri. A.Chandraghatagi, Shimoga, Karnataka.

Crop details

Crop	:	Arecanut, Coconut
Soil	:	Black clay
Area	:	1.5 acre Arecanut, 8 acre Coconut
Planting pattern	:	Areca 10' x 10', Coconut 30' x 30'
Age of crops	:	Arecanut 7 years & Coconut 25 years
Arecanut spacing	:	10' x 10'
Yield of Areca nut (7^{th} year)	:	50 qt/acre
Yield expected in year 8	:	60 qt/acre

System details

Drip system was installed for both crops.

Areca	:	20 l/plant/day till 4^{th} year, 30 l/plant/day, from 5^{th} year
Coconut	:	80 l/plant/day
Operation	:	4 hr/day
Source	:	Borewell with 5HP submersible pump.

Farmers perception on the benefits of drip system

1. The Areca plants began yielding 2 years earlier than they started in the conventional plots.
2. The whole farm could be irrigated in 6 hours. This has resulted in reduction of labour use.
3. Labour use was further reduced due to lesser weeding and reduced post irrigation works like drainage formation.
4. Early revenue generation
5. Farm maintenance cost was reduced up to 70%.

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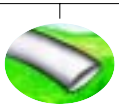
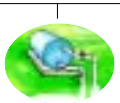
Tissue Cultured Plants & High Quality Seeds

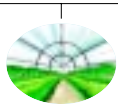

Water Well Casing & Screen Pipes


PVC, HDPE Pipes & Fittings


Drip & Sprinkler Irrigation System


Liquid & WSS Fertilizers


Bio Pesticides & Fertilizers


Green & Shed Houses

Then we purchase fruits & vegetables

Finally Process them for Export


Dehydration


Pulp, Puree & Concentrate


Domestic Market


Export Market

Jain Irrigation Systems Ltd.

Jain Plastic Park, N. H. No.6, P. O. Box 72, Jalgaon - 425 001.
Tel : 0257-250011/22, Fax: 0257-251111/22, Tlx : 0753 254 JISL IN,
E-mail: PlasticPark@jains.com, Internet: http://www.jains.com

Jain Pipes | Jain Drip | Jain Sprinklers | Jain Liquid Fertilizer | Jain Tissue-Culture | Jain Green-Houses | Jain Valves | Jain Solar

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