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High Density Planting : Success Stories of Banana Farmers

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Banana is a high value crop grown in tropical and sub tropical zones of India. High tech banana cultivation by using High Density Planting (HDP), Tissue Culture (TC) and fertigation gives very high yield and profit. Among the various states Tamil Nadu ranks first in banana area and production and second in productivity. This paper highlights the importance of HDP in banana cultivation and also presents some success stories of farmers of Tamil Nadu in banana cultivation through improved technology.

World Scenario: Bananas are the fifth largest agricultural commodity in world trade after cereals, sugar, coffee and cocoa. India, Ecuador, Brazil and China alone produce half of total bananas of the world. The advantage of this fruit is its availability round the year. The scenario of area, production and productivity of banana is given in **Table 1**.

Table 1 – Area, production and productivity of banana

	Area (ha)	Production ('000 t)	Average productivity (t/ha)
World	454470	269280	15.20
India	529700	16225	30.63

Source: (9)

The major banana exporting countries are Ecuador, Colombia, Costa Rica and Philippines and the major importing countries are USA, Belgium, Germany and United Kingdom. According to FAO estimates, India occupies the highest area under banana cultivation in the world. It may be noted that 11 percent of the total global area under banana belongs to India. India ranks first in banana production, contributing about 23% in world pool of banana production.

The export of Indian banana is mainly to UAE, Saudi Arabia and other Gulf countries. The export of fresh banana from India during the last three years is given in **Table 2**.

Table 2 – Export of fresh banana from India

Sr. No.	Year	Quantity (t)	Value (Rs. in crore)
1.	2004-05	12817	13.42
2.	2005-06	11475	16.06
3.	2006-07	14411	22.36

Source : (9)

Indian Scenario : The role of fruits in balanced diet is well documented. But there is a huge gap between demand and supply. Though the total fruit production has increased from 28632 thousand tonnes in 1991-92 to 63503 thousand tonnes in 2007-08, there is very little improvement in productivity **(Table 3)**.

Banana crop is widely grown in India and has great socio-economic and religious significance. Banana is the fourth-important food ingredient in terms of gross value exceeded only by rice, wheat and milk product. It is an important

Table 3 – Area production and productivity of fruit in some fruit growing states in India

States	Area ('000 ha)		Production ('000 t)		Productivity (tonnes / ha)	
	1991-92	2007-08	1991-92	2007-08	1991-92	2007-08
Maharashtra	256.1	1432.3	3518.4	11047.6	13.7	7.7
Andhra Pradesh	313.1	853.0	4008.2	10722.3	12.8	12.6
Tamil Nadu	136.2	292.3	1101.3	2579.8	4.7	8.0
Kerala	236.3	323.3	1101.3	2579.8	4.7	8.0
Gujarat	84.5	306.9	1828.9	5849.7	21.6	19.1
Karnataka	209.3	279.0	3191.8	4588.0	15.2	16.4
Bihar	266.9	286.2	2799.2	3552.4	10.5	11.4
Uttar Pradesh	303.2	316.0	2449.8	3757.5	8.1	11.9
West Bengal	111.3	194.3	1131.7	2766.7	10.2	14.2
Orissa	136.3	265.3	978.0	1275.1	7.2	4.8
Jammu & Kashmir	119.1	194.9	700.8	1435.9	5.9	7.4
Himachal Pradesh	157.2	202.4	339.9	713.0	2.2	3.5
Uttarakhand	150.5	171.3	428.7	717.9	2.8	4.2
Others	395.0	657.8	6287.8	7267.7	15.9	11.0
Total	2875	5775	28632	63503	10.0	11.0

Source: (3)

Table 4 (a) – Analysis of nutrients in Banana fruit (Nutritive value per 100 g)

Principle	Nutrient value
Energy	90 Kcal
Carbohydrates	22.84 g
Protein	1.09g
Total Fat	0.33 g
Cholesterol	0 mg
Dietary Fiber	2.60 g
Vitamins	
Folates	20 mcg
Niacin	0.665 mg
Pantothenic acid	0.334 mg
Pyridoxine	0.367 mg
Riboflavin	0.073 mg
Thiamin	0.031 mg
Vitamin A	64 IU
Vitamin C	8.7 mg
Vitamin E	0.10 mg
Vitamin K	0.5 mcg
Electrolytes	
Sodium	1 mg
Potassium	358 mg
Minerals	
Calcium	5 mg
Copper	0.078 mg
Iron	0.26 mg
Magnesium	27 mg
Manganese	0.270 mg
Phosphorus	22 mg
Selenium	1.0 mcg
Zinc	0.15 mg
Phyto-nutrients	
Carotene-á	25mcg
Carotene—ß	26 mcg
Lutein-zeaxanthin	22 mcg

Source : (USDA National Nutrient data base)

Table 4(b) – Nutrients content of the banana (per 100g ripe, edible banana)

S.No.	Nutrients	Amount	Daily recommended intake per normal adult
1.	Water	74%	240ml
2.	Carbohydrates	23 %	300 grams
3.	Protein	1%	50 grams
4.	Fats	0.5%	65 grams
5.	Fibre	2.5%	25 grams
6.	Carotene	21 micrograms	800 micrograms
7.	Vitamin E	0.27mg	15mg
8.	Thiamin (B1)	0.04mg	1.5mg
9.	Riboflavin (B2)	0.06mg	1.7mg
10.	Niacin	0.7mg	20mg
11.	Pyridoxine (B6)	0.29mg	1.3-1.7mg depending on age
12.	Folic Acid	14 micrograms	400micrograms
13.	Pantothenate	0.36mg	10mg
14.	Biotin	2.6 micrograms	300micrograms
15.	Vitamine C	11mg	75mg women, 90mg for men
16.	Sodium	1mg	2400mg
17.	Potassium	400mg	3500mg
18.	Calcium	6mg	1000mg
19.	Magnesium	34mg	400mg
20.	Phosphorus	28mg	1000mg
21.	Iron	0.3mg	18mgs
22.	Copper	0.1g	2.0mgs
23.	Zinc	0.2mg	15mg
24.	Chloride	79mg	3400mg
25.	Manganese	0.4mg	2.0mg
26.	Iodine	8 micrograms	150 micrograms

Source : The banana nutrition group (UK); Dickinson, 2000

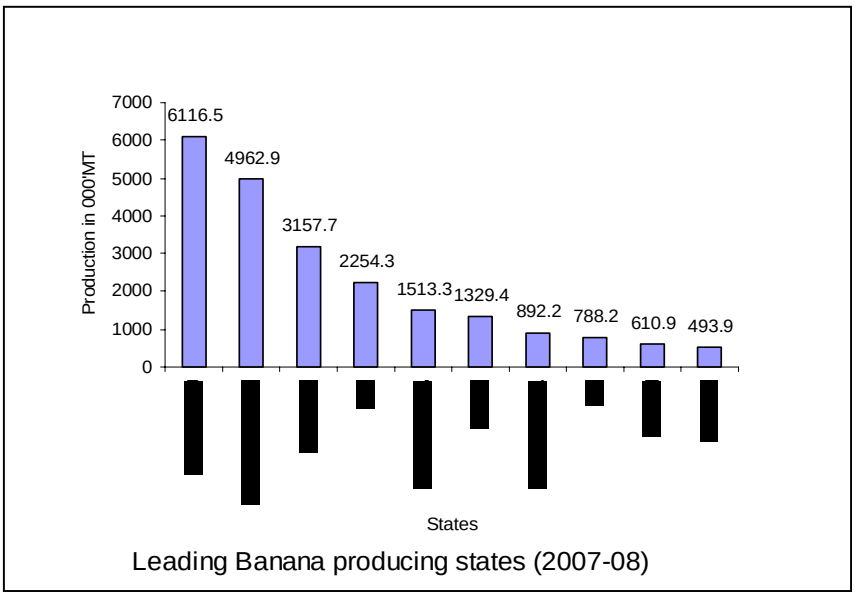
crop for small and marginal farmers. It is very rich in various food ingredients as indicated in **Table 4(a) and 4(b)**.

The major banana growing states are Tamil Nadu, Maharashtra, Gujarat, A.P., Karnataka, Bihar, W.B., M.P., Assam and Kerala. State wise area, production and productivity is mentioned in **Table 5** and **Figure 1** depicts the leading

Table 5 – Statewise area, production and productiviy of banana

Sl.No.	State/UT	Area (000' ha)			Production (000'tonnes)			Productivity (t/ha)		
		2005-06	2006-07	2007-08	2005-06	2006-07	2007-08	2005-06	2006-07	2007-08
1.	TAMIL NADU	94.6	102.2	114.1	4647.6	5019.4	6116.5	49.1	49.1	53.6
2.	MAHARASHTRA	73.2	73.4	80.0	4608.5	4621.9	4962.9	63.0	63.0	62.0
3.	GUJARAT	49.2	53.4	57.7	2498.8	2912.6	3157.7	50.8	54.5	54.8
4.	AP	65.0	72.4	75.1	1626.1	2173.3	2254.3	25.0	30.0	30.0
5.	KTK	56.4	60.8	59.9	1423.8	1558.5	1513.3	25.2	25.6	25.3
6.	BIHAR	28.0	29.0	30.5	959.3	1125.1	1329.4	34.2	38.8	43.6
7.	WB	27.8	31.7	37.4	544.9	802.1	892.2	19.6	25.3	23.9
8.	MP	15.0	14.9	15.2	730.0	773.0	788.2	48.8	52.0	51.9
9.	ASSAM	42.0	43.3	44.1	577.7	598.9	610.9	13.8	13.8	13.8
10.	KERALA	61.4	59.1	61.5	491.8	463.8	493.9	8.0	7.8	8.0
11.	OTHERS	56.8	63.9	71.4	818.5	949.3	1085.4	14.4	14.9	15.2
	Total	569.5	604.2	646.9	18927.0	20997.8	23204.8	33.2	34.8	35.9

Source : (5)



Leading Banana producing states (2007-08)

banana growing states.

Banana has a universal demand as food ingredient. It is also used intensively for religious purpose. This is why the price of banana increases steeply during festival season. It has also very high export value **(Table 6)**.

Table 6 – Country-wise export of banana from India during 2008-09

Country	Quantity ('000 tonnes)	Value (Rs. in million)
U.A.E.	10.2	247.6
Saudi Arabia	5.1	108.9
Oman	0.9	22.5
Bahrain	1.2	44.6
Qatar	1.3	31.8
Kuwait	1.5	38.4
Nepal	7.8	30.4
Maldives	1.2	13.9
Japan	0.2	3.9
UK	0.1	2.6
Others	0.9	9.9
Total	**30.4**	**554.5**

Source: (APEDA)

Soil and Climate

Banana is well suited for humid sub-tropical to semi arid sub tropic up to 2000 MSL. Banana grown under sub tropical conditions are of better quality as they develop better aroma with crisp pulp. At higher altitude banana cultivation is restricted to a few varieties like hill banana. Mean temperature for optimum growth varies 20-30ºC. Its growth declines with increase and decrease in temperature (4). Banana can be grown in all kinds of soils provided drainage condition is good. In sandy loam soil, plants grow faster compared to heavy soils. The optimum pH is 6.6 to 7.5.

Important Banana Varieties

There are large numbers of banana varieties growing in different states **(Table 7).** The major banana growing season in Maharashtra, Tamil Nadu and Kerala are mentioned in **Table 8**.

Table 7 – Important banana varieties cultivated in different states of India

State	Varieties grown
Andhra Pradesh	Dwarf Cavendish, Robusta, Rasthali, Amritpant, Thellachakrakeli, Karpoora Poovan, Chakrakeli, Monthan and Yenagu Bontha
Assam	Jahaji (Dwarf Cavendish), Chini Champa, Malbhog, Borjahaji (Robusta), Honda, Manjahaji, Chinia (Manohar), Kanchkol, Bhimkol, Jatikol, Digjowa, Kulpait, Bharat Moni
Bihar	Dwarf Cavendish, Alpon, Chinia , Chini Champa, Malbhig, Muthia, Kothia , Gauria
Gujarat	Dwarf Cavendish, Lacatan, Harichal (Lokhandi), Gandevi Selection, Basrai, Robusta, G-9, Harichal, Shrimati
Jharkhand	Basrai, Singapuri
Karnataka	Dwarf Cavendish, Robusta, Rasthali, Poovan, Monthan, Elakkibale
Kerala	Nendran (Plantain), Palayankodan (Poovan), Rasthali, Monthan, Red Banana, Robusta
Madhya Pradesh	Basrai
Maharashtra	Dwarf Cavendish, Basrai, Robusta, Lal Velchi, Safed Velchi, Rajeli Nendran, Grand Naine, Shreemanti, Red Banana
Orissa	Dwarf Cavendish, Robusta, Champa, Patkapura (Rasthali)
Tamil Nadu	Virupakshi, Robusta, Rad Banana, Poovan, Rasthali, Nendran, Monthan, Karpuravalli, Sakkai, Peyan, Matti
West Bengal	Champa, Mortman, Dwarf Cavendish, Giant Governor, Kanthali, Singapuri, Lacatan and Monthan

Source : (4)

Table 8 – Important seasons for planting followed in different states of India

State	Planting time
Maharashtra	Kharif - June – July Rabi - October – November
Tamil Nadu	February – April November - December
Kerala	Rain fed- April-May Irrigated crop- August-September

Source: (9)

Improved Fruit Production Technology

As there is practically no scope of increasing the area under fruit crop, the only alternative left is to increases the productivity. Advance technologies like High Density Planting (HDP) is a handy tool to improve the fruit productivity. HDP is defined as the practice to accommodate 4444 to 5555 plants per hectare and the yield obtained is about 60 tonnes per hectare. HDP is one of the technique to enhance the productivity per unit area both in short duration and perennial horticultural crop. In perennial crop, it is more useful because it allows efficient use of land and resources, realizing higher yield and net profit per unit area, easy canopy management suited for farm mechanization and cultural practices, efficient spray and weed control, improvement in fruit quality easy and efficient harvest of high quality product etc. There are five important means to achieve HDP. These are:

- Use of dwarf scion varities
- Adopting dwarfing rootstock and inter stock
- Efficient training and pruning
- Use of plant growth regulators
- Suitable crop management practices

There are many fruit crops where desired success has been achieved by using HDP. These crops are apple, peach, plum, sweet cherry, pear among temperate fruits while banana, pineapple and papaya among tropical fruits. In India, HDP technology has been successfully used in banana, pineapple, papaya and mango, guava and citrus where two to three times increase in yield have been obtained.

In this paper an attempt has been made to discuss about the HDP developed by Indian Institute of Horticulture Research (ICAR), Bengaluru and some success stories of banana farmers.

HDP Technology in Banana

Banana is the forth-important food ingredient in terms of gross value next to rice, wheat and milk product. In India, banana contributes to nearly 32% of the total fruit produced in the country. The normal spacing provided in "Robusta and Dwarf Cavendish" is 2.1 x 2.1 m (2267 plant/ha) with yield of 60 tonnes/ ha. Of late, the emphasis has been on the increase in the productivity by providing closer spacing. This can be done under good management condition where micro irrigation and drip fertigation could be conveniently and successfully practiced. But main limiting factor in banana in HDP is the sunlight, which effects flowering, crop duration, maturity and performance of the ratoon crop. The detail of the techniques developed by IIHR, Bengaluru is mentioned in **Table 9** and the economics of HDP in banana has been indicated in **Table 10**.

Fertiliser Need in HDP

Banana requires high amount of plant nutrients applied partly by soil and partly by added fertiliser nutrients. Estimated fertiliser requirement is 10kg FYM, 200-250gm nitrogen, 60-70gm phosphorus, 300gm potash per plant. Banana needs 7-8 kg N, 0.72- 1.5 kg P_2O_5 and 17- 20 kg K_2O per tonne yield. Generally farmers use more of urea and less of P_2O_5 and K_2O. Urea is applied in 3-4 split doses. K_2O is recommended depending upon the cultivar. Plantains need higher K than other group of cultivars. Muriate of potash is generally used as a source of K. But in soils with pH above 7.5, potassium sulphate is advantageous.

Calcium influences yield through its interaction with N, P and K. In acidic soils, use of dolomite (Mg_2CO_3) and limestone ($CaCO_3$) as soil amendments is common.

In case of acute Mg deficiencies, foliar

Table 9 – HDP technique in banana

Planting material	Sword suckers with well-developed rhizome, conical in shape and actively growing control buds weighing 600-750 g are ideal.
Cultivar	Robusta/Dwarf Cavendish
Planting time	All round the year, best yield when planted during February-March
Planting density	A plant density of 4444/ha (1.5 m x 1.5 m spacing)
Pit size	2 ft x 2 ft x 2 ft
Fertilizer dose	Soil application: FYM 40 t/ha, 200g N-100 g P_2O_5-200 g K_2O/plant/cropFertigation:150 g N and 150 g K_2O/plant/crop
Irrigation	Irrigate the crop when the cumulative pan evaporation values reach 45-50 mm under conventional methods of irrigation. Under drip irrigation, replenishment of 80% of evaporation losses is recommended on a daily basis.
Bunch weight	25-28 kg
Yield	100-120 t/ha
Advantages of fertigation	a) Higher productivityb) Economy in fertiliser use through fertigation c) Higher fertiliser use efficiencyd) Advantage of using required fertiliser at any stage of crop growth

Source: (6)

Table 10 – Economics of high density banana production (Rs. /hectare)

Cost of cultivation	Plant crop (Rs.)	Ratoon crop (Rs.)
I. Preparatory cultivation		
Land preparation	1,000.00	—-
Digging of pits (4444 pits) (1.5 m x 1.5 m spacing) (Rs.200/100 pits)	8,888.00	—-
Filling the pits and planting suckers (Rs.80/manday)	4,500.00	—-
Cost of the suckers (4,600 nos.) Rs.1.50 each	6,900.00	—-
II. Manuring		
Cost of FYM (40 tonne @ 100/ton)	4,000.00	4,000.00
Urea (1950 kg/crop) Rs.4.78/kg	9,321.00	9,321.00
Single Super Phosphate (2775 kg/crop) Rs.3.24/kg	8,991.00	8,991.00
Muriate of Potash (1480 kg/crop) Rs.4.40/kg	6,512.00	6,512.00
Fertilizer application (4 times/crop) 30 mandays @ Rs.80/manday	2,400.00	2,400.00
III. Inter-culture operations		
Irrigation, earthing up, weeding, de-suckering and propping	15,000.00	15,000.00
Cost of propping material @ Rs.20/pair of poles	80,000.00	—-
Irrigation @ 100/irrigation (40 irrigations)	4,000.00	4,000.0
IV. Plant protection	10,000.00	10,000.00
V. Harvesting 30 mandays @ Rs.80 per Manday	2,400.00	2,400.00
Total	1,63,912.00	62,624.00
B. RETURNS		
Price of 3,500 bunches with 25 kg bunch (main crop)	3,06,250.00	2,10,000.00
and 3,000 bunches of 20 kg bunch (ratoon crop) @ Rs.3.50/kg		
Value of suckers @ Rs.1.50/sucker	10,000.00	20,000.00
Total Returns	3,16,250.00	2,30,000.00
Total Expenditure	1,63,912.00	62,624.00
Net profit	**1,52,338.00**	**1,67,376.00**

Source : (6)

application of Mg SO_4 is found to be effective. Although sulphur deficiency in soils has been reported in some cases but it is not a serious problem in case of banana. Sulphur uptake is high during sucker to shooting stage but after shooting sulphur supply comes from leaves and pseudostem.

Combined foliar application of $ZnSo_4$ (0.5%), $FeSo_4$ (0.2%), $CuSo_4$ (0.2%) and H_3Bo_3 (0.1%) applied at 3,5 and 7 months after planting helps to increase yield and quality of banana. Stateswise fertiliser recommendation is given in **Table 11**.

Table 11 – Use of fertiliser in Banana crop in different states

States	Spacing (m)	Fertiliser dose			
		N (gm/tree)	P_2O_5 (gm/tree)	K_2O (gm/tree)	FYM (kg/tree)
Andra Pradesh	2x2	200	40	200	-
Bihar	2x2	125	80	225	9
Gujarat	1.8x1.8	180	90	180	10-15
Karnataka	1.8x1.8	540 (kg/ha)	325 (kg/ha)	675 (kg/ha)	40 (t/ha)
Kerala	1730-2310 plant/ha	160	160	320	10
M.P.	3x1.5-2	230	160	300	20
Maharashtra	1.5x2.5	600	720	600	100 (carts/ha)
Tamil Nadu	1.8x1.8	110	35	330	10
West Bengal	3x3	140	50	120	20
Assam	1.8x2.4	110	35	330	12

Source : (9)

Growth Regulators

In order to improve the grade of bunches 2, 4 D @ 25 ppm (25 mg/l) may

be sprayed after the last hand has opened. This also helps to remove the seeds in certain varieties e.g. Poovan and CO-1. Spraying with CCC (1000 ppm.) at 4th, 6th month after planting and plantozyme @ 2 ml/l at 6th and 8th month after planting helps to achieve higher yield.

After full development of bunch, potassium dihydrogen phosphate (0.5%) and urea (1%) or 2, 4 D solution (10 ppm.) is to be sprayed on the bunch so that banana size and quality is improved.

Fertigation

In order to avoid loss of nutrients from conventional fertilisers i.e. loss of N through leaching, volatilization, evaporation and loss of P and K by fixation in the soil, application of water soluble or liquid fertilisers through drip irrigation (fertigation) is adopted. A 25-30% increases in yield is observed using fertigation. Moreover, it saves labour and time and the distribution of nutrients is uniform. It may be mentioned here that every thing is not good with fertigation. Fertigation creates condition conducive for disease infestation (7). Rat can also create serious problem for drip fertigation. Subsidies in (about 50%) drip irrigation are the main reason of expansion in fertigation. It is therefore, difficult to say what would be the fate of fertigation if subsidy is withdrawn.

SUCCESS STORIES OF BANANA FARMERS

Story 1

Tamil Nadu ranks first in area and production of banana but in Tamil Nadu banana cultivation has a limitation because the state experiences strong winds that cause the falling down of banana plant during strong wind. Heavy rainfall or monsoon failures and absence of proper marketing are some of the limiting factors which have prevented the farmer not to go in for banana cultivation. But the farmers of Theni, Chinnamanur and Uthampalayam regions of Tamil Nadu have a different story to mention (**Figure 2 and 3**). They grow this crop in a minimum of one hectare and are fully satisfied with the profit they make. These farmers normally grow tissue culture (TC) Grand Naine (GN) banana variety. GN is a very popular variety because it has relatively good keeping quality and also an attractive golden yellow colour at maturity (9). It is domestically and internationally liked both as a fresh fruit and processed form. The technique generally followed are mentioned :

1. The field is ploughed well and furrows are formed 6 feet apart.

2. The planting is done at a distance of 5-6 feet apart in each furrow.

Figure 2 – Smiling farmer with his bumper banana crop

3. Planting is done at a depth of 6 inches in the furrow.

4. The required quantities of organic manure, 5gm phorate and 200gm neem cake are applied in each pit.

5. Watering is done thereafter through drip irrigation.

6. Fertigation starts from 10th day onwards.

7. Earthing up is done twice.

Management of Ratoon Crop

Weed is a serious problem,therefore necessary inter culture operation is done to get rid of weed infestation. Proper ratoon management is very important for higher income and net profit. In Theni area normally 3 ratoons in about 25 months are obtained. Once the flower emerges and all fruits are fully opened, the bunches are covered by bags which prevent the tender fruits from insect and pest attack and helps in maintenance of uniform temperature. This operation is very important for the development of colour and fruit. It may be mentioned here that the farmers in this area have standarised the harvesting and packing techniques. Banana has a ready market in

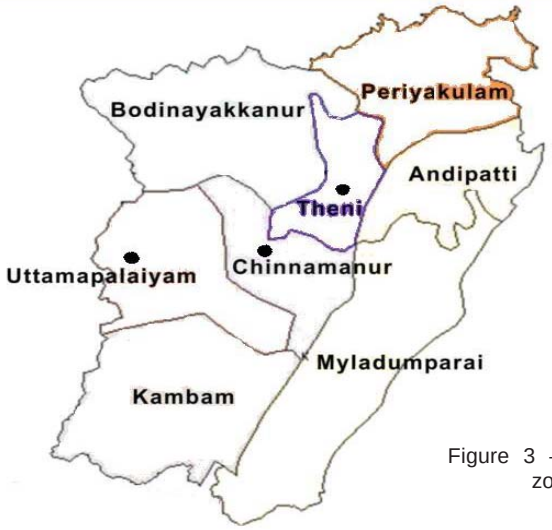


Figure 3 – Map of banana growing zone in Tamil Nadu

Source: (9)

Table 12 – Economics of banana cultivation by the farmers (Rs/ha)

Initial investment (Rs)	Yield (tonnes)	Value (Rs)	Net profit
2,00000	100	4,00000	2,00000.00
Profit from two ratoons			2,50000.00
Grand total			4,50000.00

Source : (9)

big cities like Coimbatore, Madurai, Kochi and Chennai. The price that the farmers generally get is quite high (Rs. 10-11/kg). Farmers also send their produce to distanced city like Kolkata and Mumbai. The farmers who are interested to grow banana by using this system are advised to visit the Theni, Chinnamanur and Uthampalayam area of Tamil Nadu to gather first hand information.

The data indicated in **Table 12** revealed the interesting fact that a banana farmer through the adoption of improved technique like HDP could get high yield and net profit of Rs.4.5 lakhs in about 30 months. This implies that a yearly income of Rs 1.8 lakhs could be obtained from improved method of banana cultivation.

Story 2

Irrigation water and fertiliser are the two key inputs in crop production. The use efficiency of these inputs through traditional method of application is low. However modern technique like HDP coupled with fertigation can result in very high profit in case of fruit crop like banana. A banana farmer called Mr. M Venkatesan **(Figure 4),** of Poduthampatti post, Kuddampatti village, Somanahalli, Palacode Taluka, Dharmapuri district of Tamil Nadu has adopted hi-tech agriculture with the help of Tamil Nadu Agriculture University (TNAU) under the project called precision farming being operated in Krishnagiri and Dhramapuri districts with a project cost of Rs.10 crore covering an area of 400 ha in these two districts (8). These project has become a blessing to all farmers of these districts who have been cultivating high value crops like tomato, lady finger and cavendish variety of banana.

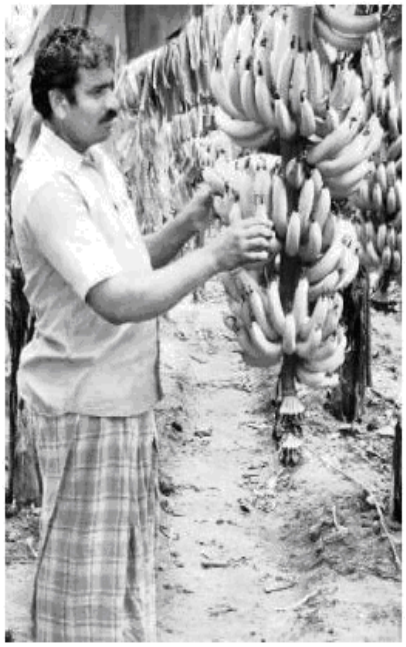


Figure 4 – Mr. Venkatesan, banana farmer of Dharmapuri having a look at his crop, which is ready for harvest

Benefit Accrued

Mr. M Venkatesan one of the farmers of the project area had cultivated G-9 cavendish variety in one hectare area. About 25 hectares being cultivated under banana crop in the Dhramapuri district. By adopting this technology Mr. Venkatesan saved 50% of irrigation water (9). The important features of the technology adopted by him are detailed below.

1. Land preparation

2. Application of 2 kg of single super phosphate, 200gm of gypsum, 20gm of furidon and 5 kg of FYM.

3. Raised beds of about 1 ft in height were prepared.

4. Cubical pits of about 2 cubic feet were duck on the raised bed.

5. The suckers were planted inside the pit and covered with soil and then water.

6. Fertigation were done once in five days.

7. Plant population was 3,000.

8. After two months of planting side suckers were removed.

9. Only one sucker was allowed to grow.

10. In the 7th month stakes were tied to the trees to prevent them from falling due to wind or rains.

11. The bunching of fruits appeared during 8th month after planting. During this time spray of poly feed over the fruit bunches was beneficial.

Economics

1. The yield obtained was 100 tonnes (11 month crop).

2. Price per tonne was Rs.8,000/-

3. Income generated Rs.8,000 x 100 = Rs.8,00000/-

4. Cost of drip irrigation was Rs.1.15 lakh.

5. Cost of per sucker was Rs.11 So 3,000x 11 = Rs 33,000/-

Emerging New Areas of Banana Cultivation

Punjab is world famous for the production of cereals particularly through rice and wheat cropping system. Efforts have been on for more than three decades to break the rice-wheat cropping system, but no visible results were recorded thus far. Of late, inclusion of banana in Punjab

is being thought to break these barriers. Interesting information in this connection has been published in *Indian Express Finance Chandigarh Edition (dated26/ 4/2010)* which is reproduced below (1).

To break the wheat and rice rotation cropping pattern, farmers in Punjab, the country's largest foodgrain growing state are increasingly taking up banana farming in a big way. Banana farming, which started in Punjab in 2006, has now emerged as an alternate form of farming with its acreage rising from just 10 acres to 500 acres in four years.

G. S. Kalkat, Chairman of Punjab State Farmers Commission said, "Planting banana on one acre gives as assured return of Rs1.5 lakh to Rs2.00 lakh." He said the Punjab government is planning to set up banana ripening chambers in Ludhiana, Patiala and Jalandhar to help growers. To make the diversification more attractive, he said, the state gives farmers a one-time capital assistance of Rs 40, 000 to build a greenhouse.

Mewa Singh, President of Banana Growers Association said "going by present day high price that bananas fetch in the market, a farmer can make over Rs 2 lakh from every acre under banana". He disclosed that domestic consumption was also very high as Punjab consumes bananas worth Rs 600 crore every year, which were hitherto imported from Maharashtra and Gujarat. With Punjab going whole hog to grow bananas like it did for kinnows (a variety of orange), the state can meet at least half of its domestic demand from own crop.

Singh claims that the quality of bananas produced in Punjab is very good as the state uses a different technique due to different weather conditions in this part of the country. The plant is sown in February so as to keep it safe from fog and frost, which helps its ripening. Banana is most suited for cultivation in states with average temperatures of 15 -35 ºC and a rainfall of 500-2,000mm every year.

However, Punjab is known for its extreme temperature, zero degree during winters and as high 48 degree in summers. The Punjab State Farmers Commission provides special technique to the farmers to cultivate bananas in such extreme temperatures.

The fruit has been included in the National Horticulture Mission and attracts a 50% subsidy for its plants and drip irrigation. According to the Punjab State Farmer Commission, it has sold 196,000 tissue culture plants this season.

Sunil Jakhar, MLA from Abohar and son of former Lok Sabha Speaker Balram Jakhar, observes that "banana's inclusion in the National Horticulture Mission recently is likely to further encourage Punjab farmers to grow bananas as up to 50% subsidy will now be offered for its plants and drip irrigation".

FUTURE LINE OF WORK

1. As there exists the scope of expansion of banana cultivation even in non traditional state likes Punjab, the efforts in this respect need urgent attention.

2. It is reported that fibre can be extracted from banana plants and a handy machine has been designed and manufactured by KVK, Rajamundry, CTRI (ICAR), A. P. Promotion of this technology would enhance income at farm level.

3. Banana consumes high amount of plant nutrients. Expansion of banana plantation would result in highs fertiliser use.

4. There exists great scope of export of value added banana products which needs urgent attention.

CONCLUSION

HIGH TECH BANANA CULTIVATION CAN results in very high yield and profit. Banana price normally dose not fluctuate so much. Rather its price goes up during the festivals. Special type banana can used as vegetable which has also medicinal value. Processed banana has both national and international demand. Banana leaves, trunk, inflorescence i.e. every part of it has a special utility. Plants are used for religious purposes as well. Cultivation of such wonderful crop plants needs due attention and encouragement which would result in higher fertiliser consumption and creation of wealth at farm level.

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