

Dykes and canal system for fruit plantation in low-land areas of Dakshin Dinajpur (WB)

Fruits orchard have the potential to provide higher returns than the conventional agronomic crops due to lower input costs and better tolerance to biotic and abiotic stresses. Maximum cultivated area in the Dakshin Dinajpur District of West Bengal is low-land which is dominantly covered with the traditional cropping system which is very low in economical return. Present intervention targeted to develop a diversity orchard in low-lands by making of dykes and canals for higher economic return. Superior and commercial varieties of different fruit crops were incorporated in the orchard. To achieve sustainable profit, good horticultural practices were followed. Benefit cost ratio was 1.25 after four years of plantation and showed a rapid increase over the next few years, as gross input cost became almost fixed and the gross return kept increasing. Therefore, a diversity orchard developed in low-land area has a great potential to achieve sustainable higher income for common farmers of Dakshin Dinajpur District of West Bengal.

CULTIVATION of traditional crops has limited ability to provide a long term desirable sustainable profit for farming community. Horticulture based cropping system has enough scope for long term sustainable profit through proper management of existing land. Well established fruits orchards have enough ability to give economical return for a long period of time if they are managed properly. Generally medium to upland is required for establishment of a commercial fruit orchard having proper drainage system. Low-land can also be used for development of commercial orchard through making of dyke and canal. The low lands are generally utilized for agronomical crops such as jute, paddy, wheat etc. from which a limited desirable profit might be achieved.

Scope and importance

Dakshin Dinajpur district of West Bengal is a rural dominant district, where majority of the land is covered under agriculture and to little extent under horticulture. The total geographical area of the district comprises 35,565 hectare high-land, 80,260 hectare medium-land, and 59,795 hectare low-land. Cultivable land of the district is 47.21 thousand hectare, of which 30.29% area is irrigated with 189% cropping intensity. The rural marginal and small stakeholders are primarily dependent on the traditional agricultural practices restricted to only field crops. Very few farmers are involved in production of horticultural crops particularly fruit crops. The farmers having medium to upland are habituated to cultivate jute, wheat, mustard, potato, fruits and vegetables. In medium to low-land, paddy is the predominant crop from which a limited profit can be achieved. These traditional methods

of cropping are generally non-profitable. Some farmers are interested in commercial orcharding of different fruit crops but waterlogging during most of the time makes their land unsuitable for the establishment of commercial orchard. However, under low-land situation, fruits crops can easily be grown on raised bund and facilitating drainage of stagnant water through canal/channel. Considering the above facts, an initiative was taken to establish a commercial orchard in low-land at Instructional Farm of Dakshin Dinajpur Krishi Vigyan Kendra with the financial support of Agricultural Technology Management Agency (ATMA), Dakshin Dinajpur, West Bengal.

Objectives

The main objective of the study was diversification of the cropping system for the low-lands of the region through commercial orcharding and up-liftment of the economic status of the farming community of the region.



Dyke and canal preparation at low-land

Methodology

The programme was started from 2020-21 and implemented at the Instructional Farm of Dakshin Dinajpur KVK. ATMA provided critical input support to develop the orchard in a productive condition. The demonstration orchard was established in 1 acre land and entrusted to the local farmers for further dissemination of this viable technology through monitoring, training and effective exposure visits. Suitable cultivars of dwarf coconut (Cvs. Gangabandhan, Kerala-1), ramphal, litchi (Cvs. Bombai and China), ber (Cvs. Miss India and BAU), lemon, water apple, papaya and dragon fruits were planted at optimum recommended plant spacing for evaluation of technology. Good horticultural practices were followed for all the crops. Farmers from different corner of this district and adjacent districts visited KVK and enriched their knowledge about the new technology.

Dyke and canal preparation

With the help of excavator, the dykes and canals were prepared at low-land for planting of different fruit crops. The length, breadth and height of the dykes were 105, 5, and 2 meter respectively, with 60 degree slope. The canal of 105 meter length, 3.5 meter width and 2 meter depth was made besides the dyke from where soil was excavated to make the dyke. Five dykes and four canals were prepared. These dykes and canals were used for planting of fruit plant and culture of different indigenous fish species, respectively.

Pit preparation

One month before plantation, the pits were prepared and refilled with mixture of different organic manures and soil. The main purpose of digging and refilling the pit was to provide nutritionally rich soil and congenial conditions for growth and development of plant, especially during the establishment phase. During the summer months (March), pits of 90 cm × 90 cm × 90 cm were dug at ideal spacing for different fruit crops (Table 1) and soil of the pit was left in the sunlight so that harmful insects pests and disease inoculums get destroyed. During pit preparation, care should be taken that the surface soil is replaced in lower portion and depth soil in upper portion of the pit to confirm the availability of fertile soil around the root feeding zone of sapling.

Table 1. Spacing of different fruit plants

Fruit plant	Spacing (m)
Coconut	7.5 × 7.5
Ramphal	In between coconut plant
Litchi	10 × 10
Seedless lemon	In between litchi plant
Apple ber	8 × 8
Lemon	In between apple ber plant
Guava	6 × 6
Dragon fruit	In between Guava plant
Water apple	2.5 × 2.5
Papaya	2 × 2

After proper sunlight treatment to the pit soil, 20 kg well-rotten farm yard manure, 3 kg vermicompost and 500 g single super phosphate were added per pit and mixed thoroughly with the pit soil. Soil drenching of pits were done with carbendazim @ 2 g/litre of water for fungal infection, 2 teaspoonful of bleaching powder for bacterial infection and one teaspoonful of granular insecticide (carbofuran 3G) as a precaution measure of future infestation.

Planting of sapling

Planting was done during the 2nd week of May, 2020 in the afternoon period. Light irrigation was applied just after plantation for settling of soil and easy establishment of the plant. Plants basins were also mulched with organic matter like paddy straw, mustard straw, dry banana leaf etc. which were available in the KVK farm.



Papaya cv Red Lady

Irrigation, weeding and nutrient management

During summer and winter season, irrigation was applied as per requirement of the plant. Irrigation was applied at 25-30 days interval during winter season and 15 days interval during summer season. Hand weeding and herbicide applicator was done to manage the weed growth. During application of herbicide, care was taken so that fruit plants do not come into contact with the herbicide solution. To supply proper nutrition to the fruit plants, it was advised to apply recommended dose of manures and fertilizers for the region, in two split doses (Table 2).

To supply proper nutrition to the fruit plants, it was advised to apply recommended dose of manures and fertilizers for the region, in two split doses (Table 2). It was observed in the survey of cropping pattern that the maximum low-lands of this district are generally occupied with some agronomical crops like rice, wheat, mustard jute etc. from where a negligible income was recorded. Occurrence of water logging conditions limits the fruit orcharding in the region. Establishment of commercial orchards at low-land using dykes and canal technology have successfully eliminated the ill effects of water logging conditions to the fruit trees and



Ber cv Miss India

proved economically more remunerative in comparison to the conventional cultivation of agronomical crops. Farmers also become aware about the fruit orcharding. The study also revealed that some fruit crops gave more economical yield compared to conventional orchard. The yield comparison in between updated low-land orchard and conventional orchard of some important fruit crops is presented in Table 3.

The yield increment of low-land orchard is due to better soil porosity and availability of plant nutrient which enhanced growth and development of fruit plants. The estimated benefit cost ratio of initial four years is presented in Table 4. The estimated benefit cost ratio recorded after 4 years of fruit orcharding is 1.25 which may increase rapidly



Lemon cv Seedless

Table 2. Recommended dose of fertilizer for different fruit

Fruit plant	FYM (kg/year/plant)	NPK (g/plant/year)
Coconut	30	500:320:1200
Ramphal	15	50:50:25
Litchi	30	600:600:250
Lemon	15	600:200:300
Apple ber	25	500:200:500
Guava	25	900:600:600
Dragon fruit	25	500:700:300
Water apple	15	150:100:50
Papaya	10	250:250:500



Litchi cv Bombay

Table 3. Yield comparison in between low-land orchard and conventional orchard

Crop	Low land orchard (kg/plant)	Conventional orchard (kg/plant)	Yield increment (%)
Ber	123	89	38.20
Lemon	81	68	19.12
Guava	121	103	17.48
Litchi	84	67	25.37
Papaya	101	84	20.24

Table 4. Benefit cost ratio of low-land orchard

Year	Gross cost (₹)	Gross return (₹)	Profit (₹)	B:C ratio
1 st	195750	0	-	
2 nd	30000	31000	1000	
3 rd	25000	185000	160000	
4 th	25000	210000	185000	
Total	275750	426000	346000	1.25

as the fruit trees started giving higher fruit yield under static input cost.

SUMMARY

Fruits orchard provide more economical return than the traditional agronomical crops. Farmers of the low-lands area are compelled to adopt less remunerative agronomical crops due to problem of water stagnation. Present methodology revealed that a commercial fruit orchard with higher remuneration can be successfully established on low-land area with scientific modification in the topography of the land into dykes and canals to facilitate drainage of stagnant water. As the low-lands are dominating in Dakshin Dinajpur District of West Bengal, there is a profound scope to increase economical return through establishment of commercial orchard at low-land with construction of dyke and canal. Different economically sound fruit plant and their superior variety should be selected for long term sustainable production. Integrated nutrient management, weed management, pruning, disease and pest management, irrigation etc. at the right time are the key factors to achieve sustainable profit. The result of four years benefit cost ratio (1.25) indicate prospects of rapid increase in benefit cost ratio over next few years as gross cost become almost fixed and gross return will increase. Therefore, the orchard developed at low-land through dykes and canals preparation has a great potential to maximize the income of common farmers of Dakshin Dinajpur District of West Bengal.

For further interaction, please write to:

Dr Siddikul Islam (Subject Matter Specialist), Majhian, P.O. Patiram, Dakshin Dinajpur, West Bengal 733 133. *Corresponding author: siddikul12@gmail.com