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Cultivation of cucurbits in off season via Riverbed Farming System

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Abstract

Nowadays, in North India people are growing cucurbitaceous vegetables extensively in the riverbeds (called Diara land, Riverbank farming(RbF),"Bagar Kheti" or"Baluwa Kheti) for off season cultivation. Riverbed also known as diara land is a basin or bank area or area between two or more stream of river and known as Khadar, Kachhar, Doab, Dariyari, Kocher, Nad, Tali and Nadiari by several local names. Diara term has been acquire from the word 'Diya' meaning earthen lamp. Diara lands are large aresa found in Uttar Pradesh, Bihar, Assam and Orissa. These lands are available only for a short period, and landless, small scale and marginal farmers cultivate on these lands the seasonal vegetables and fruits. Cultivation of cucurbits in riverbeds in the river of Yamuna, Ganges, Gomti, Sarju and other distributaries in Haryana, Uttar Pradesh, and Bihar, Banas river in Tonk, Rajasthan; Narmada, Tawa and Tapti rivers in Madhya Pradesh and Maharashtra; Sabannati, Panam, Vartak and Orsung in Gujarat; Tungbhadra, Krishna, Hundri and Pennar rivers in Andhra Pradesh, and Parnba and Manimala river beds in Kerala. The river beds contains mostly sand and moisture is seeped from the adjacent river. The farmers prepare the field and cultivate vegetables and fruits in the ditches in the riverbanks after the post-monsoon season. Watermelon (*Citrullus lanatus* (Thunb.) was the first and only the crop grown in riverbeds at the starting, later many crops belonging to cucurbits family such as bottle gourd (*Lagenaria siceraria* (Molina) Standl.), cucumber (*Cucumis sativus* L.), pumpkin (*Cucurbita pepo* L.), and summer squash bitter gourd (*Momordica charantia* L.), pointed gourd (*Trichosanthes dioica* Roxb.), sponge gourd (*Luffa cylindrica* Mill.). These are cultivated in the riverbeds. Monsoon season later, the water from the riverbeds retreats back to its channel, leaving large areas dry. These areas of land are generally left unused due to the austerity in management, conflicts of land ownership, difficult access and lack of overall motivation to cultivate marginal land. However, these riverbed areas furnish a diversity of natural resources. Proper management of the riverbeds would contribute to income generation as well as to natural resources management (minerals, forest, biodiversity, water, ecology and changing climate) and better disaster/risk management. Apart from these issues, riverbeds offer opportunities for the landless (sukumbashi) and land-poor people in their vicinity for income generation and food security. The cultivation pattern on the riverbeds is of different nature and face a large number of problems, related to irrigation, fertilization, and seed problem etc.

Key words: **Riverbed farming, musk melon, cucumber, watermelon, etc.**

Importance of riverbed farming:

Riverbed farming is vegetable cultivation on the common lands in riverbeds which are dry and nearby during the post-monsoon season, that is October to May. After the river water recedes, vegetables can be

planted in ditches dug into the seasonal sand banks, and the crops harvested before the onset of the next monsoon. It can be treated as a kind of vegetables forcing where in the cucurbits are grown under sub-normal conditions, literally on sand, during winter months from November- February, especially in North and North- Western India. About 65% of total cucurbit cropped area of the country falls under riverbeds. It can be used to increase household income and to improve the food security of landless and economically poor people. Most of the expansion of this practice are mainly due to availability of fertilizers and nutrients and improved agriculture technologies and very easily availability of riverbeds, access to transportation and markets. This method is unrelated with any other crop rotations and cucurbits are specially adapted to this system of growing due to their long tap root system.

Why cultivation of riverbed farming?

Because, there are several advantage of river bed cultivation, which includes:

- ✓ Net return per unit area
- ✓ Very early and high yield
- ✓ Ease in irrigation
- ✓ Cost of cultivation is very low
- ✓ Less mineral requirement due to high fertility
- ✓ Limited weed growth
- ✓ Easy in control of pest and disease by cultural means
- ✓ Low cost labor facilities
- ✓ No land ownership required
- ✓ Income and food security of landless and marginal farmers

Classification of riverbed according to cultivation

1. Main riverbed consisting sand- cultivation is done during December to June. Main crop is Bitter gourd and Bottle gourd.

2. Main Diara is located on beds of river. Main crop is Cucumber, Luffa, Muskmelon, Watermelon and Pointed gourd.

3. Upland diara where continuous deposition occurs less flooded and not much different from non- diara lands. Main crop is pointed gourd.

Major crops can be grown in diara cultivation

The major crops can be grown by farmers on the river beds such as water melon (*Citrullus lanatus* T.), bottle gourd (*Lagenaria siceraria*), cucumber (*Cucumis stivus* L.), summer squash (*Cucurbita pepo* L.), bitter gourd (*Momordica charantia* L.), pumpkin (*Cucurbita moschata* D.), pointed gourd (*Trichosanthes dioica* R.) and sponge gourd (*Luffa cylindrical* R.). Some farmers also grow chillies, beans, tomato and other high value vegetables on the riverbeds.

Which type of river-bed soils?

A well-drained loamy soil is more desirable for cucurbits. Lighter soils which warm quickly in springs are usually utilized for early yields, and in heavier soils vine growth will be more and fruits late in maturity. In sandy loamy soil river-beds alluvial substrate and subterranean moisture of river streams support the cucurbits. In fact, a long tap root system is adapted to the growth of cucurbits in riverbeds. This type soils should not crack in summer, and should not be water-logged in rainy season and necessary that soils should be fertile and provided with adequate organic matter. All the cucurbits are very sensitive to acid soils. The soil below pH of 5.6 no cucurbits can be successfully grown and most of the cucurbits prefer a soil pH between 6.0 and 7.0. Musk melon is slightly tolerant to soil acidity, while other cucurbits desired intermediate or normal pH. However, alkaline soils with heavy salt deposition are unsuitable for cucurbits and water melon is the only cucurbit which is slightly tolerant to salts.

Soil temperature

Soil temperature is also a determining factor for quick germination, early maturity and production. For proper growth and development the minimum temperature should not go below 10°C and maximum of 25°C. The optimum range should be around 18-22°C.

Methods of planting

There are different types of planting methods but majority of farmers choose either the pit or the ditch system of planting. It also depends on the farmers preferences and availability of labour.

1. Pit method of Planting

In the pit method, pits of 0.5 m diameter are dug 1 m

deep and 1 to 3 meters and also depending on the crops, and planted with multiple seeds, the weakest of which are thinned out as well as crops are planted in rows oriented according to the prevailing wind direction

2. Ditch method of planting

In ditch method, a trench 1 m deep is dug along the row, with 1 to 2 m (cucumber, bitter gourd and sponge gourd) or 3 m (watermelon, bottle gourd, pumpkin and squash) space between rows. Seeds are planted/spaced 0.5 m (cucumber, bitter gourd) to 1 m (watermelon, bottle gourd, and pumpkin) apart in the ditch.

Seed rate, seed treatment and sowing/ transplanting time

The seed rate required depends upon the crops to be grown. However, generally for cucumber 1.5 to 3 kg, bitter gourd and bottle gourd 3.5 to 5 kg, sponge gourd and ridge gourd 2.5 to 3 kg in one hectare area. The seed sowing is generally done for early crop in first and second week of November and some time by first week of December and late sowing is done in first week of January. The seeds are sown at a distance of 45-60 cm in the trench at a depth of 3 to 4cm.

Few growers wrap moisten seeds in gunny bags are caster leaves near the fiber burn for quick germination and in this way sprouting start after 5-6 days. As soon as sprouts are visible outside the seed coat they are planted. Generally, 3-4 pre-germinated seeds/hills in pits are sown but in Andhra Pradesh one week old seedling are planted in pits or trench.

Manures and fertilizers

Generally no practices of manures and fertilizers were used for diara land cultivation but now day's farmers started using fertilizer and since crop is taken only for one season, so organic manures and fertilizers are used. FYM or well decompose compost, groundnut or caster cake is given in first application. River silt is generally used to enhance retentively of moisture in the feeding zone. These organic manures provide some kind of warmth to the germinating seeds or growing transplants and after 25 to 30 days after sowing, depending on growth and weather conditions, top dressing of chemical fertilizers in two split doses is done, especially of nitrogenous fertilizers like urea or fertilizer mixtures. Top dressing is applied away from the plants in shallow trenches.

Weed management

In diara land areas major weeds are *Polygonum* sp. *Euphorbia hirta*, *Eclipta prostrata, Sida* sp. and *Fimbristlylis dichotoma* etc. These weeds can be eradicated manually by pulling, since soil is quite loosened due to excess sands. There is no weedicide should be used because it may mix with running water of river and May prove hazardous to human, animal and fishes.

Cropping pattern

Cucumber, bottle gourd, and sponge gourd in North India and ridge gourd in Rajasthan, MP and UP and pointed gourd in Bihar.

Harvesting of fruits

Harvesting should be done depend upon the crops and crop management. Generally cucurbits are harvested when fruits are quite tender and edible such as kartoli, kakrol and pointed gourd start flowering after 50, 60 and 80 days of transplanting, respectively. Mature fruits should be harvested at 3 to 4 days interval, otherwise, quality decline start and fruits toughened due to seed maturity. However, harvesting done at regular interval in the month of end of June to end of October. The yield potential of various vegetable is given in Table-1 which is given below-

Table 1: Crop duration and yield of cucurbitaceous vegetables in riverbed

S. No.	Vegetables	Planting Time	Harvesting Time	Average Yield (q/ha)
1	Bottle gourd	Nov-Dec	March-July	200-350
2	Bitter gourd	Feb-March	May-July	100-150
3	Pointed gourd	Nov-Dec	March-July	350-400
4	Ridge gourd	Apr-May	June-July	100-200
5	Sponge gourd	Jan-Feb	April-May	100-200
6	Cucumber	Jan-Feb	March-June	225-250

Yield, marketing and storage

The yield from river-beds of different cucurbits is

naturally variable depending upon the location and the number of crops constituting mixed cropping. The melon fruits come to the market in February-March, in Andhra Pradesh, slightly later in April in Maharashtra and Rajasthan, extending to June in West Uttar Pradesh and Haryana. Other cucurbits come earlier because they are picked in edible (vegetable) maturity stage, like bottle gourd in March and pumpkins arrive late in the market, since it is of longer duration. In years of unseasonable rainfall or floods in the rivers, the crop gets damaged and re-sowing has to be done. The mixed cropping has some advantages in that situation as it gives river-bed farmers continuous income from March to June and cushions the losses or failure of anyone crop. Generally the cucurbits fruits mature faster, immediately after fruit setting. Picking of fruits at the right edible maturity stage and regular intervals is dependent on the individual kind and varieties. In salad slicing cucumber, dark green skin color should not turn brownish yellow, or rusting and white spine color is a suitable indication for edible maturity. In small fruited type, pale green skin color is also indicative of edible maturity. Musk melon there are two groups of cultivars which behave distinctly. In one group, when fruit matures, slips out easily from the vine (Full slip stage) viz. Lucknow Safeda, Durgapura Madhu, Cantaloupes of the U.S.A etc. The other group of melons e.g. Honey Dew and Casaba, the fruits are not separated. The harvesting and marketing is done according to the local and distance marketing in different crops is as follows in the table-2.

Table 2: Important considerations for Cucurbits harvesting/marketing.

S. No.	Crops	Harvesting	Stage of fruit	Marketing size of fruits
1	Cucumber	60-70 days after sowing	Tender green fruit	Optimum length 20-25 cm (depending upon variety/ consumers demand)
2	Bitter gourd	55-100 days after seed sowing (depending upon variety)	Tender green fruit	Optimum length 20-25 cm
3	Pointed gourd	80-90 days after transplanting	Green fruits having tender seeds	Optimum length 5-10 cm
4	Ivy gourd	Tender immature fruits	Green fruits having tender seeds	Optimum length 5-7 cm
5	Ash gourd	75-125 days after sowing	Full mature stage	White wax deposition on skin
6	Bottle gourd	60-100 days after sowing 12-15 days after fruit setting	Light green colour	Seed should be soft, if examined in transverse section
7	*Luffa species*	55-60 days after sowing, 6-7 days after anthesis	Fruit should not turn fibrous and picking should be done earlier	Picking at 4-5 days interval

Constraints

The farmers enraged in this business face several problems in taking up river-bed cultivation. The major constraints are:

1. Non availability of quality seed

Riverbed culture of melons has been developed through the native inventiveness of the farmers. They keep the seeds of the fruits which are found sweet in season, unmindful and unwary of the fact that most of these fruits are produced by cross pollination before selection of the fruit for seed extraction. That is the reason why the fruits coming from river-beds are of undependable quality, especially in sweetness and flesh color, of which urban consumers often complains. Since each farmer keeps his own seed, no guarantee that a cultivar will remain pure in river-bed culture for more than one season.

2. Diara cultivation pattern does not fit in any of the crop rotation, and cucurbits are especially adopted for such type of

cultivation due to large number of problems are faced by the growers, starting from the uncertainty of availability of land on long term basis, sometimes river-course shifting fertility status, leaching, irrigation etc. besides the availability of good quality of seed. In bruise of all these problems a large number of growers are engaged in cultivating cucurbits in the river-bed areas, especially in summer growing large quantity of musk melon, water melon, cucumber etc.

2. In diara increasing erratic hydrological patterns mean the riverbeds will continue to change due to floods.
3. New river bed areas are to be cultivated by growers.
4. In bruise of high water table irrigation is also a problem. Small water lifting mechanism or bamboo tube wells may help the growers, if provided on subsidized basis.

Conclusion

Diara cultivation is vegetable development on the regular grounds in riverbeds which are dry and close-by during the post-storm season that is October to May. It can be used to increase household income and to improve the food security of landless and economically poor people as well as to give minimum input to get higher production and productivity. These river beds are formed and subjected to alluvion and diluvion action of perennial Himalayan Rivers and due to inundation caused by swollen rivers during South-West monsoon. Vast tracks of riverbeds are dry and fallow during the period from October to May. Besides cucurbits, other high value crop like tomatoes is also successfully cultivated due to its deep root system. It can be treated as a kind of vegetables forcing where in the cucurbits are grown under sub-normal conditions, literally on sand, during winter months from November-February, especially in North and North-Western India. Riverbed cultivating can be utilized to expand family salary and to improve the nourishment security of landless and land poor families of India.

References

Patel HB, Saravaiya SN, Kumar S and Patel AI. 2016. Riverbed farming. Innovative Farming -An International Journal of Agriculture 1(3): 106-107.

Singh PK. 2012. Cucurbits cultivation under Diara land. Asian Journal of Agriculture and Rural Development 2(2): 248-252.

https://wocatpedia.net/wiki/Riverbed_farming