



Effective Utilization of Mango Orchards through Fodder Production

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Mango (*Mangifera indica* L.) is one of the most important fruit crops cultivated in India. It occupies an area of 2.31 lakh ha with a fruit production of 15.03 million tonnes in India accounting for 40.5% of the world mango fruit production. India ranks first in both area and production in the world. It is cultivated in many parts of the country. The main mango producing states in India are Uttar Pradesh (23.86%), Andhra Pradesh (22.14%), Karnataka (11.71%), Bihar (8.79%), Gujarat (6.00%) and Tamil Nadu (5.09%). There are about 30 commercial varieties of mango suitable to different agro-climatic and edaphic conditions. The important varieties include Alphonso, Banganapalli, Chausa, Dashehri, Langra, Totapuri, Kesar etc. besides numerous local varieties. The important varieties and season of availability in different states is given in Table 1 and graphically depicted in Figure 1.

Table 1. Important mango growing states, varieties and season of availability

State	Important varieties	Season of availability
Andhra Pradesh	Banganpalli, Totapuri, Suvarnrekha, Neelum	Mid Feb. - mid July
Gujarat	Alphonso, Kesar, Rajapuri	April - July
Karnataka	Banganpalli, Totapuri, Neelum, Alphonso, Pairi	April - July
Maharashtra	Alphonso, Kesar, Pairi	March - July
Uttar Pradesh	Bombay Green, Dashehri, Langra, Chausa, Amrapali	May - August

Figure.1. Fruiting period in different states

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Andhra Pradesh												
Gujarat												
Karnataka												
Maharashtra												
Uttar Pradesh												

Non fruiting period
 Lean period
 Peak period

The different varieties of mango are planted in different agro-climatic and edaphic conditions during the onset of monsoon/rainy season. It takes about 3-5 years before the crop comes to flowering and fruiting. As the crop is planted in wider spacing of 3 m x 3m in high density planting and 6 m x 6 m in normal planting, the intervening space is often left vacant and weeds will occupy that space. Many a time farmers will be growing some annual crops like sorghum, maize, vegetables etc. in the initial stage successfully. However, later on due to shading by the growing mango plants, the performance of this crop may be affected and the productivity will be very less. Under such



circumstances, farmers often leave that space vacant and cultivate it to free it from weeds. This space can be used for cultivation of many fodder crops without adversely affecting the performance of main crop of mango. Further due to hardy and tolerant nature of fodder crops, one can obtain reasonably good yield these fodder crops.



Photo 1. Grazing guinea in mango orchard



Photo 2. Signal grass in mango orchard



Photo 3. Mixed grass cultures in mango orchard



Photo. 4. Mixed grass cultures in mango orchard

Scope of fodder crops

The newly planted mango orchards require about 3-4 years before they start bearing fruits on commercial scale. The flowering and fruiting of grown up mango trees will be usually seen for about 4-6 months depending upon the agro-climatic conditions per year and rest of the time it will be vegetative growth. Thus a well planned introduction of fodder crops will be able to make use of the intervening space without posing any competition to mango for any resources or detrimental to the performance and productivity of mango trees. Since the mango and fodder crops will be drawing their solar radiation and soil bound nutrients and moisture at different levels, there will not be antagonistic competition between mango and fodder crops.

Suitable fodder crops

The fodder crops selected for intercropping in mango orchards should be basically tolerant to shading of tall growing mango trees. They should be able to grow and establish under a wide variety of conditions where a mango orchard is established. They should not pose competition to the mango plants and should not be an alternative host for any insect pests and pathogens of mango plants. Further, they should be tolerant or adaptable to the fertilizer, irrigation and other management practices followed for mango. For example, there will be a lesser frequency of irrigation to mango trees once they start flowering and fruit setting. Under such circumstances, the fodder crops should be able to withstand moisture stress and still perform and produce higher biomass. A large number of perennial fodder crops have been identified for intercropping in mango orchards, viz. guinea grass (*Panicum maximum*), bajra napier hybrid (an hybrid between *Pennisetum americanum* x *Pennisetum purpureum*), signal grass (*Brachiaria* spp), perennial fodder sorghum (*Sorghum* spp), grazing guinea (*Panicum maximum*), Rhodes grass (*Chloris gayana*) etc. among the perennial grasses and *Stylosanthes* spp and hedge lucerne (*Desmanthus virgatus*) among leguminous fodder crops. These fodder crops, once planted or sown, would be providing fodder for more than 2-3 years without decline in the green fodder productivity. Further, the leguminous fodder crops may be grown in the mango tree basin and due to biological nitrogen fixation, they will be having complementary soil fertility improving ability, besides acting as weed suppressing crops.



Agro-techniques of fodder cultivation in mango orchards

1. Selection of crop

The selection of fodder crop depends on the agro-climatic conditions and soil types. The high rainfall area with moderate soil fertility is suitable for the cultivation of guinea grass and bajra napier hybrid, while low rainfall areas are suitable for cultivation of signal grass, perennial fodder sorghum, Rhodes grass, grazing guinea, Stylosanthes and hedge lucerne (Table 2).

2. Variety and seed rate

There are several high yielding varieties of fodder crops for planting in mango orchards. Varieties tolerant to shade, moisture stress and high level of intra crop competition for solar radiation, moisture and poor soil fertility are ideal for cultivation. The seed rate and planting method depends on the age of the mango trees and spacing. As aged trees exhibit well spread vegetative growth and root proliferation, the vacant space may be less and hence lesser seeds/planting material is required. On the other hand younger mango plantations with lesser spread will need higher seed rate/planting material.

3. Sowing/planting and after care operations

As most of the mango orchards are rainfed, the sowing/planting of fodder crops should be done during the beginning of rainy season. It will be around May-June in southern zone and June-July in central and northern zones. Before the planting the land should be cleared of weeds and prepared for sowing or planting of fodder crops. The spacing for most of the fodder crop vary from 45 cm x 45 cm to 60 cm x 60 cm for stem cutting / root transplanted grasses to 30 cm – 45 cm row spacing for seed sown crops. The sowing or transplanting of fodder crops should be carried out when there is good soil moisture in the soil. After 10-15 days of planting or sowing, gap filling should be taken up to ensure good plant population. The crop should be inter-cultivated at 30-45 days stage to control weeds and provide good aeration to root system and earthing up of soil to the base of the fodder crop. Intercropping of grasses with leguminous fodder crops in 1:1 or 2:1 ratio would be helpful in ensuring good fodder for the animals.

4. Nutrient management

The fodder crops need good supply of nutrients for their growth and good yield. This can be met through application of about 5-10 tonnes per hectare of well rotten farm yard manure (FYM) before final land preparation. Further application some 2-4 tonnes per hectare of FYM after each cut would ensure optimum soil fertility for the good growth of the fodder crops. In case of non availability of FYM chemical fertilizer may be used on the basis of soil fertility test values. Usually 50 kg nitrogen, 50 kg phosphorus and 30 kg potassium per hectare as basal application and 50 kg nitrogen as topdressing after every cut would be sufficient. Further application of FYM to basins of mango plants would help avoid the competition for nutrition between mango and fodder crops.

5. Water management



In general the mango orchards are rainfed in nature in many areas and hence no irrigation is given additionally. However during prolonged dry spells life saving irrigations is given either by drip irrigation or check basin method. Therefore the fodder crops are grown by and large as rainfed crops, hence no irrigation is given. However, when there is prolonged dry spell, 1 or 2 irrigations may be given as sprinkler irrigations or alternate furrow irrigations. During irrigation to fodder crops care should be taken to ensure irrigation is not spilled over to mango row during flowering stage, which may detrimental to the mango crop affecting the flowering and fruiting.

6. Plant protection

Usually the fodder crops are free from insect pests or pathogen needing plant protection measures. Only clean cultivation would be good enough to ensure good fodder crops. However mango is susceptible to insect pests and pathogens during flowering period. Hence it requires some plant protection measures. Under such circumstances, it should be ensured that the fodder crops are harvest after minimum of 10-15 days after spray to mango to ensure that the spray drifts are below toxic levels in fodder crops which are fed afresh to animals.

7. Harvesting and yield

Under normal rainfall conditions the first cut of fodder crops will be ready in 60-75 days after sowing or planting. The fodder crops should be harvested at 10-15 cm stubble height to ensure good regeneration of crop. The duration and frequency of subsequent cuts depend on the distribution and quantum rains. Under well distributed rainfall of 5-6 months about 3-4 cuts of fodder may be taken. One inter-cultivation after each cut would reduce weed population and be helpful to fodder crops for vigorous regeneration. The green fodder yield varies from 10-80 t/ha/annum depending on fodder crop, stage and population of mango, soil condition, amount and distribution of rainfall. Well maintained fodder crops remain in the field for more than 3 years without any problem or decline in productivity.

Table 2. Summary of agro-techniques for fodder crops in mango orchards

Fodder crop	Varieties	Propagation	Seed rate	Spacing	Green fodder yield
Guinea grass	BG 1, BG 2, DGG 1, PGG 518, Co 2	Seed, Root slips	3-6 kg/ha or 40000 root slips	45 cm x 45 cm	60-80 t/ha
Bajra napier hybrid	DHN 6, IGFRI 5, IGFRI 7, CoBN 5, BNH 10, Yashwant, APBN 1	Stem cuttings, Root slips	30000 rooted slips or 2 eye budded root slips	60 cm x 60 cm	60-80 t/ha
Signal grass	DBRS 1	Root slips	40000 root slips	45 cm x 45 cm	30-40 t/ha
Perennial fodder sorghum	CoFS 29, CoFS 31	Seed	10 kg/ha	30-45 cm rows	40-60 t/ha
Rhodes grass	Rhodes 10	Seed, Root slips	5 kg/ha or 40000 root	45 cm x 45 cm	20-40 t/ha



			slips			
Grazing guinea	Improved local	Seed, slips	Root slips	5 kg/ha or 40000 root slips	45 cm x 45 cm	20-30 t/ha
Stylosanthes spp	Phule kranti	Seed		10 kg/ha	30-45 cm rows	10-20 t/ha
Hedge lucerne	Improved local	Seed		2-3 kg/ha	45-60 cm rows	10-20 t/ha

