Chapter 9
Sustainable and Circular Mango Farming Through Redesigning Sales Contracts

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ABSTRACT

Mango orchards in Bihar are managed through four different types of sales contracts, namely fully self-managed, short-tenure sales contract, long-term sales contract, and last quarter sales contract. This study has attempted to appraise the impact of different types of sales contracts on mango yield and farmers' income. Results indicate that last quarter sales contract is most sustainable followed by fully self-managed contracts. The remaining two contracts are neither sustainable nor financially viable. The higher sustainability of the last quarter's sales contract is attributed to clean landholding of the owners, optimal use of flowering inducers (PBZ), and segregated rights of merchants and owners.

1. INTRODUCTION

India is endowed with huge varieties of mangoes with sizeable value of produce (INR 385681.7 million) and significant value of export of mangoes from India (INR 4455.4 million). The total cultivable area of mangoes is 1.19% of the total area under cultivation in India and only 30% of mango orchards are irrigated. More than four fifths of the farmers in mango orchards are marginal and small farmer with less than one hectare land holding. Bihar is also significant contributor in mango production with average productivity of 9.82 metric ton per hectare. The harvest season of mangoes hovers between June and July. Bihar produces different varieties of mangoes namely Bombay green, Chausa, Dashahari, Fazli, Mallika, Amrapali, Gulabkhas, Kishen Bhog, Himsagar, Zardalu, Langra, Dhudhia Maldhah, Sinduria etc. Major mango producing districts are Darbhanga, Samastipur, Muzaffarpur, Purbi Champaran, Vaishali, Bhagalpur etc. Total value of mangoes produced in Bihar is approximately INR 59828.3 million underscoring its importance in national production. This study attempts to investigate various sales contracts (Table 3) in vogue among farmers and merchants and its degree of sustainability in future generations in Bihar.

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2. USE OF CULTARS (PBZ) IN MANGO ORCHARDS AND LINKAGES WITH SUSTAINABLE FARMING

Rahim et al. (2011) highlight the controversial effect of paclobutrazol (PBZ) in North Sudan in floral induction of mangoes and suggest to use it if the temperature is lower than 20 ^{0} C. In Indian context, Reddy and Kurian (2008) conclude that the application of paclobutrazol at 5 gram a.i per tree as soil drench for three consecutive years and then discontinuation for three years seems to give higher yield in Alphanso mango trees. Yeshitela 2006) advocates the positive impact of PBZ in South Africa and Euthopia mango trees with improved yield and quality. Singh et al. (2012) adds that PBZ 7.5 ml is most effective in Litichi for higher yield. Yeshitela (2004 also suggests that PBZ has suppressed vegetative growth and augmented fruit yield of 'Tommy Atkins' mango in Ethiopia. Costa et al. (2012) argue that radioactivity level of fruits is abysmally low with application of PBS in mango trees. Various studies highlight that use of PBZ is useful in increasing yield of mangoes and still it need to be confirmed in Bihar on different varieties of mangoes. On the other side, merchants or traders owning mango orchards use excessive dose of PBZ resulting into excessive yield with severe ramifications for the primary stakeholders.

Reganold et al. (1990) advocate that the resource conserving methods with modern agriculture with less dependency on chemicals can achieve sustainable agriculture. Horrigan et al. (2002) also argue that sustainable agriculture is not only necessary for food security but also very important to the health of human and environment. Wezel et al. (2014) suggest that organic fertilization, reduced tillage, drip irrigation and biological pest control have high potential for better food production with less detrimental impact on human and environment. D'Souza and Ikerd (1996) pose various questions for sustainable farming and size cum attributes of small farms. Pretty (1994) also adds that better livelihood of farmers can only be achieved through paradigm changes in professional norms and practices. Kirsten and Sartorious (2002) suggest that the new institutional economic framework is required for timely supply of inputs to small farmers and for better price of their produce from traders. Robertson (2015) highlights that several environmental issues namely climate change, loss of biodiversity and increasing pollutions have serious repercussions food security. He also argues that the socio ecological models through right incentives and political will can only pave the way for sustainable agriculture with better trade off between farming and society. The producer and trader share three different types of contract in the farming (Rehber, 1998; Wolz & Kirsch, 1999) with varying degree of control between producer and trader. First type of contract has empowered producers with high decision making ability. Second type of contract has shared decision making due to partial contribution of resources. Third type of contract is more skewed towards traders and aggregators. In the last two decades, there is increasing focus on food security with resource conserving methods with sustainable status of environmental and human health which can be better achieved with more decision making authority with producers rather than traders and aggregators of crops. Especially in mango farming, Indian farmers have experienced various types of contractual relations with traders right from exclusive rights of orchards management to limited rights of post harvest activities only. Further section will explain the rational followed by the prevalent modes of contract in mango farming in India for better understanding.