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## **Contract Farming and Indian Agriculture: Can Agribusiness Help the Small Farmer?**

**Braja Bandhu Swain\***

### ABSTRACT

Farming based on a contract between farmers and agro-processing and/or marketing firms is catching on in Indian agriculture due to increase in the demand for processed products, change in consumption pattern and conducive policy environment. The logic behind the promotion of this form of farming is to encourage private investment in agriculture and to reduce price risks as well as post-harvest losses, especially risk-oriented fruits, vegetables and high value crops. The private sector may play a role in providing a range of services to small holders from input supply to crop assembly and marketing. In this context, the present paper explores at what extent contract farming would remove the constraints faced by the small holders in Indian agriculture and help them to move out from the poverty trap. It was observed that contract farming cannot be seen as a panacea for all the problems afflicting the Indian agriculture while it has the potential to address the problems relating to access to market (input and output), new technology and price stability, it leads to problems like degradation of traditional knowledge, soil quality and bias towards large farmers. A need is suggested for better institutional mechanism to make contract farming more inclusive and sustainable.

**Key Words: Contract Farming, Private Investment, Small Farmer and Indian Agriculture**

**JEL: Q13, Q16**

### I

### INTRODUCTION

The initiation of liberalised economic policies in the 1980s which got accentuated in 1990s did not leave the Indian agriculture unaffected. It has witnessed the production crisis reflected in declining productivity, deceleration in output growth, increasing the cost; and so farmers are increasingly being placed at the bottom of the income ladder. This has manifested itself in the form of farmer suicides in the country at a rate of unheard in history.<sup>1</sup> This is not to say that market-oriented reforms have not brought any benefits for agriculture in general and farmers in particular in India. There are evidences to show that market-oriented reforms brought new opportunities to agriculture in general and to high-value crops in particular.<sup>2</sup> Dev and Rao (2005) and Gulati (2006) argued that market-oriented reforms is coincided with a change in consumption pattern wherein the share of foodgrains in consumer's food basket declined and that of high-value products like meat, vegetables and fruits have

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\*International Livestock Research Institute (ILRI), New Delhi-110 012.

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increased. This appears to have provided new opportunities for primary producers (farmers) in India to earn higher income by focusing on high-value crops/products as well as better access market.

Nonetheless, due to a low level of productivity compared to international level, weak institutional mechanisms and lack of basic infrastructure (Dev, 2008; Balakrishnan *et al.*, 2008) along with exploitative supply chain (Khan, 2007), small and marginal farmers are reported to have not benefited from the market-oriented reforms. In such a scenario, the private sector may play a role in providing a range of services from input supply to crop assembly and marketing by bringing better institutional mechanisms. In response to this the promotion of contract farming has emerged as an interesting alternative. In line to this, notable policy documents – The New Agricultural Policy (2000), Food Processing Policy (2004), National Policy for Farmers (2007) and Inter-Ministrial Task Force on Agricultural Marketing Reforms (2002) – have recommended promoting contract farming in Indian agriculture.<sup>3</sup> The logic behind promoting this form of farming is to encourage private investment in agriculture and to reduce price risks as well as post-harvest losses.

In this context the present paper tries to explore to what extent contract farming would help in removing the constraints faced by small holders in Indian agriculture and help them to move out from poverty trap by reviewing the theories of contract and empirical studies. The paper is divided into four sections. Section II discusses the extent in dissemination of contract farming in Indian agriculture. Section III analyses the impact of contract farming on Indian agriculture in general and farmers in particular, while Section IV conclude and suggest how to go forward.

## II

### DISSEMINATION OF CONTRACT FARMING IN INDIAN AGRICULTURE

Contract farming dates back to the 19th century, when the mechanism was used in the United States for crops like sugar beets and cling peaches. In the early 20th century, it spread to banana cultivation in Central America (Silva, 2005). Recently contract farming has become widespread in the developing countries like India, China, Thailand, Vietnam, Mexico, Brazil, Costa Rica, Honduras, South Africa, Kenya and Senegal. Contract farming is not the new management practice between the primary producers and agro-processors in India. It was being practiced in the colonial period when Indian farmers supplied the agricultural products like cotton, indigo, and tobacco to English factories for either sale or processing.<sup>4</sup> This further extended to sugarcane and seed cultivation in the early 1950s (Deshpande, 2005). The dawn of modern contract farming in India, however, could be traced to Pepsi Foods Ltd. installing a tomato processing plant at Zahura in Hoshiarpur district, Punjab, in 1989. Given the conducive policy environment and increase in demand for process products, the particular form of farming has been extended to wide variety of

crops from traditional to high-value ones like tomatoes, potatoes, chill, gherkins, basmati rice, cotton, and also in different seeds (Table 1).

TABLE 1. TYPOLOGY AND CLASSIFICATION OF CONTRACT FARMING OF DIFFERENT CROPS IN INDIA

Crops (1)	Type of contract <sup>b</sup> (2)	States <sup>c</sup> where contract farming is in operation (3)	Number of CF schemes (4)	Ownership (5)	Services provided <sup>d</sup> (6)	Banks involved (7)	Organization form <sup>e</sup> (8)
Tomato	Q/LP	PN, HY, J&K, HP, UTC, TN, GUJ	5	Pvt.	E, I, T	-	3 or 2
Potato	Q	HP, PN, WB, JHA	2	Pvt.	C, E, I, T	SBI, ICICI	2 or 3
Gherkin	Q/P	AP, KA, TN	30	Pvt.	E, I and T	NABARD	2
Basmati Rice	Lr	PN, MP, HY	5	Pvt.	E, I, and T	-	-
Seeds	Lr/Q	AP, PN, HY, MH, MP	20	Pvt./Pub	E & Seed	-	3 or 5
Cotton	Q	TN, KA, MH, AP, GUJ, OD	7	Pvt./Pub	E, I	-	1 or 2 or 3
Chili	Q	PN, KA, TN	3	Pvt.	E, I and T	-	1 or 3
Oil Palm	Lr	AP, KA	3	Pvt.	C and E	Syndicate Bank	3
Poultry	Q/Lr	AP, KA, TN, OD	2	Pvt.	I, E and C	SBI	3
Cheese/Milk	Q/Lr	HP, PN	2	Pvt.	C, T	NABARD	3
Jatropha	Lr	RA, CH, GUJ, TN, MH, AP	5	Pvt.	T, I	SBI, Vysya Bank	3 or 1
Medical Plants	Q/Lr	TN, UTC	2	Pvt.	T, I, and C	SBI	3
Wheat	Q/Lr	MP	2	Pvt.	T, and I	-	1 or 2
Barley	Q	KA, PN	2	Pvt.	T, I and E	-	2
Others <sup>a</sup>	Q/Lr	PN, KA, J&K, AP, TN, HP, UTC, MP, GUJ, HY, MH, UP, OD, CH	15	Pvt./Pub	T, I and seed	SBI	2 or 4

Source: Developed by the author drawing from various news-papers, reports, research papers and websites.

Notes: a: marigold, vegetables, soybean, baby corn, banana, pineapple, papaya, safflower, coleus, seaweed, aromatic crops, sweet corn, citrus, maize and apples; b: Q –quality control; P –perishability; Lr –large scale processing; c: AP = Andhra Pradesh, HY = Haryana, J&K = Jammu and Kashmir, HP = Himachal Pradesh, UTC = Uttaranchal, TN = Tamil Nadu, GUJ = Gujarat, PN = Punjab, WB = West Bengal, JHA = Jharkhand, KA = Karnataka, MP = Madhya Pradesh, MH = Maharashtra, OD = Odisha, RA = Rajasthan, CH = Chhattisgarh; d: C –credit; E –extension; I –inputs; T –technology; e: 1 –nucleus estate; 2 –centralized out-growers; 3 –multipartite model; 4 –informal; 5 – Intermediary.

From Table 1 it is evident that contract farming is being practiced in 100 different schemes in around 25 crops and livestock production and that it prevails in all the major states in India. The crops involved mostly annual crops both for the domestic market and exports. However, it is dominant in major agricultural advanced states like Punjab, Tamil Nadu, Andhra Pradesh, Haryana and Maharashtra, and high-value crops like gherkins, seeds, cotton and tomatoes. Quality control is the main objective in most contracting schemes while provision of extension service and basic inputs for better production is the common practice. It is evident that contract farming can fall in any of the following five different organisational forms such as nucleus estate, centralised out-growers, multipartite, marketing contract and intermediary contract.<sup>5</sup>

Multipartite model is practiced in most contracting schemes followed by centralised model while it is very less of intermediary contract. Financial institutions mainly banks have involved in contracting schemes to facilitate and improve the production.

### III

#### CONTRACT FARMING AND INDIAN AGRICULTURE

The concept of agricultural development through contract farming has invoked much controversy. There are two schools of thought on effectiveness of contract farming in less developed countries (LDCs)—the Harvard Business School thought and the Food First thought (Glover, 1984).<sup>6</sup> The first one stresses that agriculture is an international system wherein small farmers could gain by involving in it, and sees agribusiness as a means of developing rural areas in LDCs. The second thought, best represented by Lappe and Joseph Collins (1977) of the Institute for Food and Development Policy in Oakland, California, hold the opposite position. They argue that the internationalisation of agriculture hurts the small farmers by exposing them to a danger of not growing nutritious food crops.

The studies from abroad on the outcome of contract farming, one sees a mixture of both positive and negative (Clapp, 1994; Payer, 1980; Baumann, 2000; Key and Rusten, 1999; Glover and Kusterer, 1990; Goldsmith, 1985; Glover, 1987; Simmons et al., 2005; White, 1997; Porter and Howard, 1997). The proponents of contract farming have analysed it by looking at income and employment generated in the farm through contract production. On the other side, opponents have examined it by looking at power structure and the sustainability of soil fertility, yield and water level under contract production.

#### 3.1 *Contract Farming and Small Farmer*

Contract farming can be analysed in the framework of the principal-agent model, where the firm (principal) works with the farmer (agent) to produce or grow a crop. The firm chooses a farmer and sets the contract terms and conditions. The farmer, in turn, chooses whether to accept these conditions, and participate in new production method or not. A combination of these choices describes a farmer's participation in contract farming. It is more likely that the firm initiates the contract, the farmer's participation in contract farming depends more on the firm's criteria rather than any of his or her choice (Simmons *et al.*, 2005). Studies have reported that transaction costs have important bearing on the contract and therefore the firms are likely to prefer relatively large farmers than smaller ones (Singh, 2002; Kumar 2006).<sup>7</sup> They argued that small farmers in Indian Punjab could not take full advantage from contract farming as they were discriminated by the processing firms due to uneconomic size of landholdings and resource constraints. The average landholding

of a contract farmer is 12.33 acres which was much above the average operational holdings in the state (i.e. 9.5 acres).

However, it may not be true always. In case of labour-intensive crops we can expect higher participation of small farmers compared to large ones. The firm has greater incentive to work with labour-surplus households because growing perishable crops like French beans require regular monitoring by the farmers, which cannot be done by hired labour due to high monitoring costs. A study by Dev and Rao (2005) on gherkins cultivation under contract farming in Andhra Pradesh found that small landholders were given priority by the BHC Agro (India) Ltd. More specifically, they found only 23 per cent of larger farmers cultivating gherkins while it was 47 per cent for small and marginal farmers. BIRTHAL *et al.*, (2005) observed similar results that small farmers benefited from vegetable contract in peri-urban Delhi and milk contract in Punjab. On the other hand, Kumar *et al.*, (2007) noticed the discrimination against small farmers by public farmers while it is not the case of private firms. It could be argued that farmers' participation in contract farming not only depends on nature of crops but on objectives and nature of the firm.

### 3.2 Contract Farming and Income

In Indian agriculture, the presence of a number of intermediaries in supply chain results in the weak transmission of market signals about the quality and price to the farmers. In this process the middlemen essentially pool the available surplus from farmers paying little attention to quality. It is evident from vegetable market, other than the pure broker/middleman (adati, who is a commission agent and works on a fixed percentages basis) extract all profits generated in the transaction process. So the producer's (farmer's) share of the consumer's rupee seldom exceeds 20-25 per cent (Khan, 2007). However, by entering into contract production would improve market efficiency and farmer's income share. The aim of a contract is to organise production in such a way that the income generated through the co-operation will be higher than that without it.<sup>8</sup> The income from contract mode of production can be therefore evaluated relative to the income generated in non-contract situation. The income generated by the contract mode of production could be higher than that of the non-contract situation in three distinct ways. One, firms promote the cultivation of high-value crops, which provides higher incomes to the farmers (Singh, 2002; Key and Rusten, 1999; Glover, 1987). Two, the price provided to contract farmers for contract crop is generally higher than market prices which could remove the middlemen in supply chain and improve the farmers' income share. Three, increasing efficiency, which reduces the costs of production, also increases farmer's incomes (Ramaswami *et al.*, 2005; Key and William, 2003).

Assume that a processor's and grower's actions are taken sequentially, which involve different time periods ( $t = t_0, t_1, \dots, t_n$ ), rather than one time period. A firm and a farmer enter into an agreement to trade an agricultural commodity. At  $t_0$ , the

firm and farmer may sign a contract constraining any subsequently verifiable action. At  $t_1$ , the procurement game begins, with the farmer choosing an investment and effort, denoted by  $I \geq 0$ . The farmer's investment is observable but not verifiable due to information asymmetry. At  $t_2$ , the firm makes a take-it-leave-it offer of a quantity  $Q \geq 0$  and total payment is  $T \in R$  for the farmer. At  $t_3$ , the farmer may accept or reject this offer. Again this is verifiable. Since a complete contract necessarily fixes the quantity (Q) and payment (T), it leads the farmer to set  $I$  at  $t_0$ . The outcome of the contract may be simply inefficient; no party (either firm or farmer) can change their strategies if any shock arises. If the payment is not satisfactory for the farmer, it may reduce his interest to participate in the contract mode of production. As a result, the farmer may reduce the allocation of land for the contract crop, and in the long run, not join in the contract production. Thus, it could be argued that the net income generated in the contract should be shared between the farmer and firm if contract farming is to be sustained.

If one party, either a farmer or a firm, finds that the contract outcome is lower than the non-contract ones, the contract may not sustain. Let  $U^F$ , the expected utility of the farmer (F), and  $U^C$ , the expected utility of the firm (Figure 1). Figure 1 demonstrates the pre and post contract welfare for the individual agent and the total welfare. Without the contract, the utility possibility frontier is  $U_0$ . So we can assume the pre-contract utility is at  $(U_0^F, U_0^C)$ , represented by point A. After the contract, the farmer can access credit, inputs, technology and better management, which were unavailable before, and the firm can have access to better quality and timely supplies. Thus, the total welfare increases and the utility possibility frontier shift to  $U_1$ . The empirical studies in this regard have found that both the farmers and firms are better-off after they entered into a contract (Singh, 2002; Dev and Rao, 2005; Kumar, 2006; Kumar and Prakash, 2008). At the same time, contract farming helps the farmers to earn higher income by focusing on high-value crops compared to non-contract ones. Studies on gherkin farming in Andhra Pradesh by Dev and Rao (2005), Swain (2011) and in Karnataka by Nagaraj *et al.*, (2008) found that higher yields and assured price for the gherkins that have boosted the income of the farmers. In addition, Swain (2011) found farmers could earn high income by growing contract crops as it is high-value in nature. On the other hand, Singh (2002), Dileep *et al.*, (2002) and Kumar (2006) found that contract farmers could earn higher income than non-contract farmers in growing tomatoes due to higher yield and stable price.

The question is who benefits from the increased welfare (profit), either both farmer and firm or only one agent? As depicted in Figure 1, will the new equilibrium point be at point W, B, E, or S? At point B, the processing firm gets all the profits from the contract. On the other hand, at S, the farmer gets all the profits from the contract. The answer depends on each party's bargaining power within the contract.

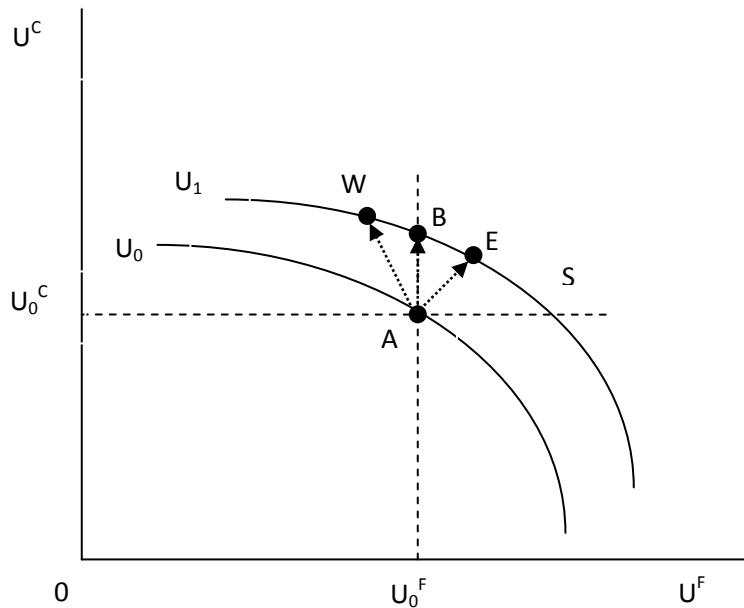


Figure 1. Total Outcome Before and After the Contract.

However, evidences indicated that the farmer's share in total income that is generated in contract farming may not last long if the firm is a monopsonist. The argument is that in an "ex-ante" contract, there is scope of discretionary power available to both parties which decrease the discretionary latitude (Bernheim and Whinston, 1998). Generally, the firm has better information and in the upper hand of the contract. In such situations, firm may use its monoposony power, trying to renege on a contract by reducing the price or by pushing for a better crop quality. As a result, farmers end up making net losses while processors make substantial profits from the same crop. This particular problem is observed by Singh (2002); Dileep *et al.*, (2002); Kumar (2006) and Swain (2005).<sup>9</sup> So an important aspect of the contract design must be to ensure a proper balance of discretionary latitude between the firm and farmer to limit exploitation. First-best outcomes can sometimes be achieved through later renegotiating the simple initial contracts. When a simple contract has apparent gaps in them, they can be optimal in the sense that they can be filled at the time of renegotiation ex-post. So, at the margin, it will be optimal for the firm to offer a contract to farmer with conditions that provide him with an expected utility equal to  $U_0^F$ , the farmer's reservation utility. This is the case represented by point B. If the contract is fair and the farmer has better bargaining power, the profits from the contract may be shared equally at E. However, the farmer usually has less bargaining power, and he may not be able to arrive at the point E. It is possible to improve the bargaining power of the farmer through an increase in non-farm income, an increase

in the options for accessing markets and better information about the contract. This may reduce the relative power of the firm.

### 3.3 Contract Farming and Efficiency

Contract farming is expected to increase farmer's efficiency either through exploiting economies of scale (Macdonald, 2006) or through providing better knowledge and inputs (Key and MacBride, 2003; Ramaswami *et al.*, 2005; Baumann, 2000) that would not be otherwise available. The argument follows like –for growing the contract crop, contractor (agro-processing firms) facilitates the cultivation<sup>10</sup> to access the recommended quality and quantity in meeting the consumer's demand (Key and Rusten, 1999; Key and MacBride, 2003; Singh, 2002; Eaton and Shepherd, 2001). As a result it reduces a farmer's risks in accessing inputs, modern technology and market price fluctuation (Hueth and Ligon, 1999) and on the other hand increases the financial leverage. Since processors have direct interest to improve the product quality, they usually offer improved and better technical assistance more effectively than the government's agricultural extension services (Minot, 1986). They also have an incentive to learn from farmer's experience and modify their advice accordingly. Contract farming could therefore serve to relieve farmer from credit, input and output market constraint, and enabling them to apply inputs at an optimum level. Better technology and management practices in contract farming brought by the processors thus increase the overall farm productivity and efficiency. For instance, Ramaswami *et al.* (2005) observed that contract production is more efficient than the non-contract production in poultry farming in Andhra Pradesh due to the lower cost paid for inputs by the contract farmers.

Profit can be maximised through the optimum utilisation of inputs. If inputs are to be utilised in an optimum manner, certain marginal conditions have to be satisfied. All factors (land and labour) of a comparable nature tend to receive the same marginal return and the value of a marginal product must be equal to the marginal cost of the factor. Generally, in the farming sector, the value of a marginal product of factors of production (land and labour) is less than the marginal cost because of existence of imperfection in agrarian factors market (Bardhan, 1980). The same reason may persuade farmers not to apply inputs at an optimal level. The decline in the use of inputs reduces total farm efficiency by reducing the efficiency of land and labour.

The studies have also shown that contract farmers are able to achieve higher productivity compared to the non-contract ones (Kumar, 2006; Dileep *et al.*, 2002; Ramswami *et al.*, 2005). Specifically, Kumar (2006) found that contract farmers are economically efficient than the non-contract ones in growing potatoes, however, no differences exist between the two in growing basmati rice. By estimating marginal value of product (MVP) and marginal factor cost (MFC) Dileep *et al.*, (2002) uncovered that tomato contract farmers use resources efficiently compared to non-



contract ones. On the other hand, Ramaswami *et al.*, (2005) found, due to the lower feed-conservation ratio in contract poultry farming, contract famers are efficient as compared to non-contract ones.

The method of production and extension services provided by a processing firm to a farmer for growing the particular crop may even lead to a spill-over effect. The spill-over effects could occur in two cases –the interaction with firm’s technician by a contract farmer in nurturing the contract crop could improve farmer’s knowledge and have positive impact on non-contract crops. On other hand, it could occur to non-contract farmers as well learning from neighbour’s experience. In this regard, Warning and Key (2002) note that the spillover effect in contract farming have led to an increase in productivity of non-contract crops grown by the contract farmer. Similarly, Bolwig *et al.*, (2009) also found positive technology and investment spillover effects from contract farming of organic coffee to food crop farming in Uganda. On the other hand, Glover (1984) argued that while internalising the modern knowledge passed by processing firms, some farmers might find it difficult to retain the traditional knowledge they have had for generations. In addition, it will have negative impact on non-contract crops.

### 3.4 Contract Farming and Environment

Contract farming is a complex phenomenon and it is not easy to assess its consequences on long-term development goals like preserving the environment in terms of soil quality, water and land productivity. Early experiences show that by and large contract farming has a negative effect on environment as firm does not look after the long-term development of soil and water. Opondo (2000) argued in this regard that though contract production transfers the responsibility of production decisions from individual farmer to a firm, the firm takes only decisions regarding production but does not take over the responsibility of safeguarding the soil quality. Firms allow the farmers for heavy use of agro-chemicals to increase productivity and protect crops from insects. On the other hand, the farmer is responsible for investing in the long-term maintenance of the quality of his land and its productivity. Siddiqui (1998) argued that the over-exploitation of ground water, salination of soils, soil fertility decline, and pollution are typical examples of environmental degradation due to contract production.

While studying the impact of contract farming on land quality, Morvaridi (1995) observed that intensification of agricultural production due to contract farming in Eastern Turkey has degraded the land quality by around 3 per cent in three years. On the other hand, Ornberg (1996) argued that the excess use of pesticides for the contract crops was the major source of soil degradation in North Thailand. In addition, excess tillage of soil also degrades its quality (Lawrence, 1999). Coming to the Indian context, Singh (2002) observed that the intensity of agro-chemicals use and water is very high in case of contract crops of tomatoes and potatoes farming in

Punjab compared to non-contract one.<sup>11</sup> The problems of ground water exploitation have been observed in Gujarat, where a Canadian company, MNC-McCain, undertakes contract for potato farming (Singh, 2008). Similarly, Swain (2011) has observed that farmers were using high amount of agro-chemicals for contract crops compared to non-contract crops which has a negative impact on soil fertility. This has not taken care by the firms.

#### IV

#### CONCLUSION AND THE WAY FORWARD

From the above discussion it could be concluded that though contract farming more or less does away with market uncertainty and helps the farmers in accessing better technology; and achieving higher efficiency, more income and increased employment, it generates the problems like degradation of traditional knowledge, degradation of soil quality, sometimes extract more benefits from farmers and bias towards large farmers. It tends to suggest that contract farming cannot be seen as a panacea for all the problems afflicting the Indian agriculture while it has the potential to address that is being confronted by the Indian farmers. Contract farming as it is being practiced today is at best a partial cure for the many ills that Indian agriculture suffers from.

There is need for a better institutional mechanism to make contract farming more inclusive. As pointed out, only a certain section of farmers having better endowment participate in contract farming. In the context of inclusive development, local self-government institutions (panchayats) ought to play an important role in the process of structuring contracts in more transparent manner. The regulations on leasing land should be relaxed so that small farmers can enlarge their operational holdings. Two major factors have to be addressed—security of tenure for tenants during the period of contract and right of the land owner to repossess the land after the contract is over. While contracts are essentially between two private parties, the role of government in protecting the interest of farmers (especially the small holders) can be over emphasised. There are at least two ways in which the government could improve the functioning of contract farming and its extension to a larger number of farmers. First, the state could regulate the market to ensure that the contracting firms do not abuse their market power. Second, the state could encourage agribusiness firms to initiate new contracts with small holders by providing various incentives.

In addition, the income opportunities of the farmers have to be increased for strengthening their bargaining power. In line to this, Agriculture Produce Market Committee (APMC) Act should be modify and strengthen for facilitating the contract farming. Though, APMC act is active most Indian states, it has not been implemented properly and small farmers are not benefited from this. The fact that when a farmer has several options for obtaining inputs and credit it reduces the relative power of the contract company significantly. Direct subsidies to small farmers may also be helpful. Since contracts in contract farming do not include sustainability of soil quality and

the sustainable use of groundwater, the government could take initiatives such as promoting drip irrigation and organic farming (may be through subsidies). It can also regulate the use of pesticides.

#### NOTES

1. Farmer suicides in the country from 1997 to 2007 were 1, 82,937 (Nagaraj, 2008). The suicide mortality rate (SMR) (suicide deaths per 100,000 persons) for male farmers nearly doubled in 10 years from 9.7 in 1995 to 19.2 in 2004 (Mishra, 2006). A relatively higher incidence of suicides among a sub-group could be indicative of a larger socio-economic malaise. Most studies observed that suicide rate is higher among small and marginal farmers (Mishra, 2006; Sridhar, 2006).

2. The trend of market-oriented reforms, driven by the World Trade Organisation (WTO) and structural adjustment programmes in developing countries has led to an expansion of the international agriculture product market. Studies suggest that market liberalisation has led to a change in production patterns in both developing and developed countries (Simmons *et al.*, 2005).

3. The New Agricultural Policy (2000) visualized that participation of the private sector would be promoted through contract farming and land-leasing arrangements, which would help technology transfer and capital inflow while assuring markets for the products, especially for oilseeds, cotton and horticultural crops. The Food Processing Policy (2004) emphasised on contract farming by focusing on consolidation of supply chain to reduce transaction costs and encouraged the entry of large food retailers to procure fresh produce from farmers, and make the produce directly available to consumers. The National Policy for Farmers (2007) envisaged that a code of conduct for contract farming or a model of contract would be developed to meet commodity-specific requirements.

4. For details, see Duvvury (1986).

5. In nucleus estate model firm manages the cultivation practices and owns the farm. The centralized organisational form is a vertically coordinated model, where the firm controls the cultivation practice in the beginning of the planting and procures the output from farmers. In multipartite model government, financial institutions like bank and private companies jointly involved for functioning of contract. It has separate organisations responsible for supplying credit, production management and marketing. Intermediary model, the middlemen/traders, who establishes the relation between farmers and firm, plays an important role in the functioning of contract. This type of contract is observed when large food processor purchases crops from individuals “collectors” who have informal arrangements with farmers. The informal model includes individual entrepreneurs, traders or small companies who have informal contract with a farmer to procure a particular commodity in a season. This contract is otherwise named as seasonal contract. The duration of contract period is four to six months. For details about these models see Eaton and Shepherd (2001).

6. For details, see Glover (1984).

7. We have discussed earlier that small farmer incurs high transaction costs as they are confronted with access to new technology, product market and factor market.

8. Costs here mean the costs of contract enforcement, time and the like. For more details, see J.W. Friedman (1986).

9. Singh (2002) found that the farmers have to wait at the factory gate for a day or more. This led to weight loss due to evaporation and the company would then receive a more concentrated product for the same price. Longer delays resulted in spoilages and a higher rejection rate. Swain (2005) also observes similar behaviour in case of sugarcane cultivations in Odisha, where in actual procurement takes place after 5 to 10 days after the harvest. This results in weight loss for the farmers but higher sugar realisation for the company.

10. Contractor provides all variable inputs such as parent seeds, fertiliser, pesticide and techniques for growing the contract crop (Singh, 2002; Eaton and Shepherd, 2001).

11. Irrigation intensity is higher in the case of contract crops such as tomatoes, potatoes and chilies, which need to be watered eight to 12 times compared to five or six times for other crops like wheat. Pesticides and fertilisers are also used at much higher levels for these crops compared to traditional crops. For instance, potatoes need 108 kg of NPK (inorganic fertiliser) per acre against only 78 kg for wheat and 60 kg each of phosphorus and potassium. Tomatoes require 60 to 90 kg of nitrogen, 60 to 100 kg of phosphorus, and 60 to 120 kg of potash per acre. Similarly, the chip potato requires four or five pesticide sprays; the seed potato crop requires six to seven sprays and the tomato crop 14 sprays, all of which are environmentally unsustainable (Singh, 2002).

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