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Management of Risks in Agriculture: A Synthesis

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Indian farmers and rural communities face various types of risks in the process of agricultural production and disposal of agricultural output. The nature and magnitude of risk which agricultural producers face varies from farmer to farmer and from region to region. What is certain, however, is that the existence of potential risk in farming increases the vulnerability of the agricultural producers, especially small and marginal farmers and those operating in less favourable production environments. Vulnerability of the agricultural producers is compounded by low carrying capacities of the producers and their increased dependence on loans from institutional and private sources for meeting consumption requirements and for coping with the consequent output and income losses.

Vulnerability of agricultural producers arises on account of two types of risks that the agricultural producers face. One is the risk of loss of production or output due to unfavourable weather and soil conditions. The other is the risk on account of depressed prices due to various types of market conditions, resulting from changes in overall supply and demand situations and export – import policies of the government. Low yields and consequently decreased production, leading to reduced incomes for the producers, are particularly common in rain-fed production environments where the producers are dependent to a very large extent on monsoon conditions. Dryland or rain-fed agriculture is practised in India on over 65 per cent of the net sown area and hence even minor variability in rainfall can result in severe yield and production losses. Given the large proportion of area under such a risky production environment, the number of agricultural producers who are subjected to production risks is obviously high.

Yield and production risks on account of rainfall variability are compounded by poor soil environment in which producers cultivate their crops. Problems of salinity and waterlogging are increasing and considerable national loss and loss to individual farmers occur on account of the poor soil

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conditions. This problem is also evident in irrigated tracts of the country where farmers face the risk due to reduced production because of poor soil health.

A second major source of risk for agricultural producers is the risk of financial loss on account of price variability in agricultural commodities. A fall in prices of agricultural commodities results in reduced returns to producers. Since options for deferring sales to tide over depressed prices are limited, especially for the small and marginal farmers engaged in subsistence farming with limited marketable surpluses, it is essential to analyse as to what extent such losses occur and develop policy alternatives to combat such risks. Related to this is the risk from price competition and changing export-import policies of India and importing countries that may lead to poor price realization for exportable commodities. Besides poor price realization, these trade policies and WTO requirements outlined under the Agreement on Agriculture and Sanitary and Phytosanitary provisions relating to product safety and quality, can also impact farmers production decisions; thereby increasing their risks and vulnerability.

An analysis of the nature and magnitude of risk which the agricultural producers face on account of the above mentioned conditions is essential to develop coping strategies to manage eventualities arising on account of the risks. The kind of strategy that producers adopt in order to cope with crop failures, reduced yields and depressed prices and the impact of the manifestation of risk on the income security of the producers, is often based on the producers previous experience of such an eventuality and must be taken account of while formulating region, crop and farmer specific strategies for preparedness to deal with such occurrences and also for developing policies for providing institutional support to the affected producers.

The papers received for discussion at this conference deal with both an assessment of the nature and magnitude of risks due to unfavourable production environment and depressed prices as well as with coping strategies adopted by producers. Kehar Singh has examined the economic efficiency in respect of fish production in Tripura and decomposed the economic efficiency into technical efficiency, resulting from production practices and management of production and allocative efficiency resulting from imperfections in markets and prices. Using frontier production function approach, the authors have estimated that over 96 per cent of the difference between observed and frontier output is primarily due to factors that are under the control of farms, i.e. due to technical inefficiencies. The mean economic efficiency under risk has been estimated at 34.11 per cent. The economic inefficiency due to technical risk and allocative risk has represented 20.86 and 45.03 per cent of the existing economic inefficiency.

Tripathi *et al.* have examined the efficacy of contract farming as a mechanism for mitigating risks due to prices and markets by potato growers in Haryana where DCM Shriram Consolidated Ltd is sourcing potato through contracts with producers. The price assured by the contracting firm being considerable higher than the market price in the area, gross income and net income of the producers under contract farms has been higher than that of non-contract farmers. Also, the yield variability on contract farms has been found to be lower than that on non-contract farms, thus reducing yield and production risks. While there has been no price uncertainty in case of the contract farming system of potato production as the contracting agency has procured the produce on fixed price, there has been high variability in market prices, implying high risk for non-contract farms.

Kalamkar similarly argues that contract farming and forward markets may be convenient and safer options to cover market risks, especially as they ensure guaranteed incomes for small and marginal farmers besides making the nation as whole globally competitive. Effective insurance against price volatility can be provided through these mechanisms. Contract farming can serve as a mechanism to reduce the market and income risk faced by the farmers when diversifying away from food crop to new commodities as price stability is a major benefit to the producers. Similarly, futures trading allows farmers to hedge against market risks. However, transactions cost is a formidable barrier to the participation of farmers in futures markets. The author has suggested that the government can foster the development of contractual arrangements by facilitating the creation of producer organizations, legislating an appropriate contract law and enforcing it effectively, strengthening and improving the quality of (public and private) agricultural extension services, providing complementary infrastructure, and developing effective land administration systems. Contract farming will require amendments of the State Agricultural Produce Market Act to legally permit farmers to sell directly to agribusiness firms.

Stressing the emerging importance of futures trading as a means for covering price and market risks, Singh *et al.* have examined the long-run equilibrium relationship between the futures price and the cash price and have evaluated the extent to which such exchanges provide a hedge against price risk in wheat and maize, the major cereal crops. The futures market serves as a risk-shifting function, and can be used to lock-in prices instead of relying on uncertain price developments. Analysis of the time series data on futures and spot prices has shown that while in the short-run there may be disequilibrium between the two, in the long-run the futures contract behave in an expected manner and there exists a mechanism for long-run equilibrium in the maize as well as wheat crops. This phenomenon of price convergence

for both maize and wheat crops has clearly depicted that the farmers are mitigating price risk as spot prices and future prices converge.

Singh *et al.* have analysed the coping strategies adopted by producers in three NARP zones in Uttar Pradesh subsequent to the drought of 2002-2003. Based on past experience, some of the strategies adopted by agricultural producers in the area to cope with the drought situation and mitigate risk involve damage control and low investment and provide as insurance against loss. Water harvesting, intercropping, cultivating low value crops, higher concentration of fodder crops in a combination of fodder and grain crops rather than grain alone, and lower use of purchased inputs are some of the mechanisms commonly used by farmers during the drought. The authors have recommended that rainfall probability analyses in a continuous basis must form a component of risk reduction strategy in the area. Further, preparation of a drought vulnerability index for different districts is necessary as a ready reference for combating the effects of drought. Based on farmer responses, the authors have suggested that the Meteorology Department's monsoon forecasting methodology needs some serious re-thinking.

Samal and Pandey have analysed the impact of climate risk on livelihoods of rice farmers of Orissa on the basis of a village level study. During the past eight years, abiotic stresses due to drought, submergence or cyclone have affected rice production and the livelihoods of farmers in the study area, where rice cultivation is primarily rain-fed. Considerable income losses were suffered by farmers due to these abiotic stresses. The authors have reported that through non-farm income and crop diversification farmers have been able to reduce the effect of rice income losses. Hence, more non-farm employment opportunities are needed to be created in the area to improve livelihoods of rice farmers. Development of varieties tolerant to submergence and having high yield and introduction of crop insurance scheme in the area for rice crop are some of the other strategies suggested to combat production risks faced by producers in the area.

Jain *et al.* have examined the output risk faced by oilseeds farmers in Rajasthan. Production of these crops in the Rajasthan state is prone to risk over time and across the agro-climatic regions because of rainfall behaviour, prolonged drought periods, and limited water resources in the state. Performance of oilseeds crops has indicated that yield fluctuations exists in almost all the oilseeds crops. However, the area and yield instability of the mustard crop is declining over time, possibly because of increase in irrigation facilities, development of location-specific technologies and better input management. However, this requires to be further strengthened for overall agricultural improvement. Since both price and non-price factors govern

acreage, price incentives alone would not be sufficient to bring the desired changes in cropping pattern. Hence a policy of better implementation of support price system, development of consistently performing varieties and further enhancement of irrigation facilities are necessary for ensuring stability in the Rajasthan agriculture.

The role of credit institutions in managing risks faced by agricultural producers due to drought has been examined by Badatya. Reduction in farm income forces the vulnerable small and marginal farmers to borrow from other sources to meet consumption needs and erodes their repayment capacity in respect of institutional loans. A strategy adopted by NABARD under such circumstances is conversion of short-term loans into medium-term loans and rescheduling of repayment of earlier converted loans. While this strategy provides temporary relief from repayment of bank loan and lower repayment installments, farmers have reported several problems on account of this mechanism like increased debt burden, non-availability of fresh finance, and loss from crop insurance scheme.

Mandal *et al.* have also examined the problems related to financing of agriculture in the North-Eastern Hill Region. They have reported that nationalized banks have shown a lukewarm response towards financing crop loans in the region on account of paucity of updated land records, lack of entrepreneurship development and poor repayment capacity. Since hill farming in the North-East region of India is severely constrained by high risk and uncertainty arising from various factors, it fails to attract significant private investment. The prevailing risk and uncertainty situation compels them to operate at low-input and low-output subsistence levels with low volume of marketable surplus. On one hand, the farmers are constrained by insufficient equity capital to invest in agricultural operations and on the other hand, investing non-equity capital to farm business increases the existing level of risk as sufficient incremental net returns are not forthcoming. Financial institutions face difficulty in financing the hill agriculture in view of low repayment performance and increasing non-performing assets for agricultural loan. Also, the absence / poor performance of crop insurance scheme in some of the hilly states increases the risk of hill farming considerably.

The economic analysis of potential gains from insurance has been attempted by Pandey *et al.* for oilseed crops. Expected prices and price risk are important determinants of oilseeds production. Based on available information on prices and price risk, farmers do form expectations and determine future course of action. The authors have highlighted the economic significance of price expectations and price risks and have observed that these economic variables could play an important role in policy decisions to

improve oilseeds production in the country. A specific peril insurance based on rainfall and other meteorological variables has been suggested as a viable alternative. If crop insurance schemes are carefully designed to meet the financial needs of oilseeds growers, and offered on time with a reasonable administrative cost, oilseeds growers will be benefited and yield and income risks will be substantially covered.

Several other papers have examined yield and production risks in agriculture in general as well as in relation to specific crops. Singh has analysed yield variability in different zones of Jharkhand and the participation of farmers in the National Crop Insurance Programme. Yield variability in several agricultural commodities in Haryana has been analysed by Yadav *et al.* Instability in production of foodgrains in Madhya Pradesh has been analysed by Awasthi *et al.* and crop insurance has been suggested as a viable means for coping with instability. Rathi *et al.* have examined the production and price variability associated with major crops in Satpura Hills region of Madhya Pradesh. Sharma and Rai have suggested optimum cropping plans for enhanced sustainability and for reducing income risk for Haryana farmers. Waghmaere *et al.* and Chand *et al.* have analysed the implications of diversified farming as a mechanism for risk minimization in western Maharashtra and Rajasthan, respectively. The papers clearly bring out the high degree of yield and production variability in agriculture and the potential gains from diversification and crop insurance for minimization of risk

Several authors have analysed risk in relation to specific commodities. Some of the commodities covered include oilseeds (Vitonde *et al.*), lac (Pal *et al.*), aromatic plant — Patchouli (Tilekar *et al.*), coconut (Basnet and Jadhav), and mango (Naik *et al.*, Rane *et al.* and Wadkar *et al.*). While the first paper on mango has dealt price volatility and profitability, the other two papers have looked at specific interventions to reduce risk in production. The use of technology as an intervention for ensuring higher yields has also been examined by Kishor *et al.* who have analysed the impact of grain combine harvesters on yield and output.

The importance of contract farming for managing risk in agriculture has been discussed by Arya and Asokan. While stressing the importance of contract farming in Indian agriculture, the authors feel that contract farming may bypass small and marginal farmers as contracting firms attempt to minimize transactions costs. Venkatram and Venkatesan have analysed the gains from contract farming in case of the medicinal plant *Coleus*. It has been found that though the price offered by contracting firms was lower than prices received by non-contracting farms, this has compensated by the

increased yields obtained by contracting farmers resulting from provision of monetary and technical inputs by the firms.

An assessment of adoption of improved technologies in animal husbandry has been made by Arora *et al.* While it is possible that improved technologies may lead to production losses through the uncertainties associated with them, the authors have reported that practices are profitable as well as physically and culturally compatible and hence risk minimizing. In another paper, Thirunavukkarasu and Kathiravan have estimated losses on account of foot and mouth disease in livestock. The authors have indicated that economic losses from the disease can be seriously high for the farmers.

Other papers have analysed farmers' attitude towards risk and the coping mechanisms adopted by them to mitigate the effects of risk. Chauhan and Navadkar *et al.* have proposed the novel idea of crop insurance in mitigating the agricultural risk in Himachal Pradesh and Western Maharashtra region, respectively. They have opined that the benefits of this tool are of multifarious type and the crop insurance scheme has become an important measure for increasing the crop production, improving economic conditions, stabilizing income and providing additional employment to the farmers.

In general, the papers included for discussion at the conference have examined yield and production risks due to climate variability and price risk. Authors have also discussed the coping mechanism of farmers in the event of a drought or natural calamity. While the research papers have provided valuable information on various aspects of risk in agriculture, no one has concentrated on production and yield variabilities due to factors other than rainfall, such as other climatic variables, viz. temperature, humidity and length of growing period and poor soil health among others. There is also a need to examine the nature and magnitude of risk associated with international trade in agro-products, especially in the context of the changing trade regime and the researches need to be geared to pin-pointedly evaluate the impact of such measures on the agricultural competitiveness. This must have been due to paucity of data and proper characterization of exportable produce across various regions/states. This needs to be focused in order to provide a holistic approach to risk mitigation and formulation of appropriate policies for risk management. Perhaps, some of these issues may find a place during the discussions in the conference.