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Yield Risk Perceptions and Pest Management Decisions in Paddy

P. Indira Devi, D. Sai Jyothi and P.D. Geevar*

The paper estimates the yield loss perceptions of farm community associated with integrated pest management (IPM), in an ecologically sensitive rice ecosystem in Kerala and analyses the factors influencing the behaviour of the farming community. The pesticide applicators and non-adopter farmers of IPM perceive a very high yield risk which is much higher than the realised yield in IPM farms in the area. It was very high at an average 67.92 per cent by the non-IPM farmers, 55.85 per cent by the pesticide applicators and 15.85 per cent by the IPM adopters, than the average yield in the chemical pest control method. The study establishes the influence of factors like age, education training support and farming experience on the perception of yield loss. Further detailed research focus is warranted in this aspect. Besides, it is found that scientific data on yield realisation in IPM farms are lacking or inadequate. This situation highlights the need for realistic data generation on the long term yield effects of IPM technology in paddy, as this forms the basis for location-specific technology standardisation by the researchers, policy formulation by the planners and adoption by the farmers. Hence, the realistic data generated, must be translated effectively to the policy makers and farming community through targeted training programmes.

Crop Insurance in India: An Introspection and Alternative

Prawin Arya, N. Sivaramane and D.R. Singh[†]

Indian agriculture is highly risky enterprise as farmers are exposed to both production and price risks. The central government implemented various crop insurance schemes to protect the farmers against production risk from time to time. These schemes were based on the yield approach and meant for production risk only leaving market component. In this study an attempt has been made to suggest an alternative to cover both production as well as price risk after reviewing the previous schemes. The normal curve technique was employed for the estimation of the premium rates using gross revenue as a variable in place of yield. The finding of the study showed that the revenue premium rates were lower compared to yield premiums in Uttar Pradesh. It can be concluded that revenue insurance approach can

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be a feasible alternative option to yield insurance as it can offer insurance product at a lower premium rate for providing effective loss coverage to the farmers. Further, under revenue approach, indemnity paid to the farmers can be determined on the basis of actual cost of cultivation.

Economic Analysis of Risk of Gastrointestinal Parasite Infection in Cattle in Meghalaya

Subhasis Mandal*, **Subhasish Bandyopadhyay***, **K.K. Datta****,
K.M. Bujarbaruah[†] and **Pallabi Devi***

Livestock and its products are subject to various risks, such as production risk, market/price risk, government-influenced risk, and personal or human risk. The important production risks include weather variability, pasture and fodder growing conditions and pest and disease attack. These factors cause considerable economic loss through affecting the performance and quality of animals and also increasing the cost of production and thereby impact the financial outcomes. Among the production risks, disease attack is one of the major factors affecting the productivity of animals. Within these diseases, parasitic diseases are important component and cause great concern for the livestock management of the country. Gastrointestinal parasites are highly prevalent in the north-eastern states including Meghalaya and accounted for a significant economic loss across the various livestock species. The economic gain due to strategic treatment for gastrointestinal parasite has been estimated and observed to be positive over the control group. Productivity of cattle in terms of milk yield was estimated to be considerably higher due to strategic anthelmintic treatment of the cattle. Enabling farmers to use clean and safe pasture and regular deworming of the cattle may be suggested to reduce the risk of parasite infection and to minimise the economic loss. Government may take up programmes to educate the cattle farmers on strategic management against parasitic infestation and in simultaneously making available of various anthelmintic medicines to the cattle farmers. This public responsibility of the government to minimise the risk and economic loss due to gastrointestinal parasite infection may reduce the private cost thereby increasing the social benefits in Meghalaya.

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Drivers of Crop Diversification in Rainfed Areas of Andhra Pradesh

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In this paper, an attempt is made to assess the effectiveness of crop diversification in reducing the variability in gross incomes, using both secondary as well as primary sources of data. Three drought prone districts, one each from the three agro-climatic and political regions of the state of Andhra Pradesh were chosen, viz., Prakasam in Coastal Andhra, Anantapur in Rayalaseema and Mahabubnagar in Telangana. Three diversification indices namely, index of maximum proportion, Herfindahl index and Entropy index were constructed for average cropping patterns in the triennia of 1969-72, 1985-88 and 2002-05. It was found that diversification increased in Prakasam and Mahabubnagar districts while specialisation increased in Anantapur district. The coefficient of variation in yield index, farm harvest price index and gross income index were computed for the sub-periods, 1969-81 and 1993-2005. It was found that the coefficients of variation decreased over time in the districts where diversification increased and the same increased in Anantapur where specialisation took place. These results were further validated using data from 80 sample farms each from the three study districts. The regression equation fitted to analyse the determinants of crop income indicated that crop incomes decreased with an increase in the crop diversification index. Another regression which was fitted to find out the drivers for crop diversification suggested that those farmers who gained access to crop loan insurance through borrowing from institutional sources and those who purchased rainfall insurance did not diversify their cropping patterns much, implying that those who have access to formal insurance schemes shunned diversification and tried to maximise their incomes through specialisation.

Natural Calamities, Rice Production Loss and Risk Coping Strategies: The Case of Orissa

Parshuram Samal*

The paper estimates the production losses in rice due to various natural calamities in Orissa over the period 1964-65 to 2005-06 using secondary data and analyses the coping strategies followed by the farmers using primary data from 100 farmers. The production loss estimates revealed that the losses due to droughts are more than floods and cyclones. The production loss from severe drought was as high as 38 lakh tonnes as against 11 lakh tonnes from severe flood and 18 lakh tonnes from severe cyclones. Out of 46 years, droughts have occurred in 16 years, floods in 6 years and

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cyclones in 5 years, which means the frequency of droughts, is much more than other natural calamities. The income sources of the farm families are found to be diversified. The analysis of income during a calamity year revealed that rice contributed 9 per cent to the total income as against 31 per cent during a normal year. To cope up with the calamity, which occurred late in the *kharif* season, some family members migrate and some attended public works like construction of roads, buildings, bridges etc. to earn additional income to meet their consumption needs. The marginal farmers compensated their income loss through public works. The study suggests some short term, medium term and long term policy measures to bring about stability in rice production. In the short term, the presently available drought and submergence tolerant varieties/advanced cultures developed by Central Rice Research Institute, Cuttack and Orissa University of Agriculture and Technology, Bhubaneswar should be exploited through extension agencies. Also, Government should take necessary steps to encourage crop insurance in all areas. In the medium and long term, Government should encourage expanding tubewell irrigation in Orissa, wherever it is feasible to combat the drought situation. In the long term, more research funds should be diverted in developing rice varieties tolerant to various stress situations like droughts and submergence. These measures will not only stabilise rice production but also improve the poverty situation in the state.

Risk Attitudes of Households in Semi-Arid Tropics of India

K.P.C. Rao[†]

Risk and uncertainty are the characteristic features of dryland agriculture. Yield risk is more prominent in the semi-arid tropics of India due to the vagaries of monsoon. Households do take risks when the expected returns are high enough relative to the variability in returns or probability of loss. Improved technologies generally promise more returns but are also risky. The risk attitudes of the decision-makers do matter in the selection of different enterprises and production technologies. Whether risk attitude is a personal trait or is influenced by demographic or socio-economic characteristics of the decision-makers has been an important research question with very few empirical investigations. This paper seeks to revisit the seminal work of Binswanger three decades ago which used experimental approach to measure the risk attitudes of households in six villages of semi-arid tropics (SAT) of India. The study used similar experiments and much enlarged sample of households from the sample villages in 2005 to assess the risk attitudes. The results indicated that the households in the study villages have become more risk averse than they were in 1978. The regressions of risk aversion coefficients on the demographic and socio-economic characteristics of the households were rather poor

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fits suggesting that risk attitudes are more personal traits than they are determined by demographic and socio-economic characteristics. However, it was found that the households from Andhra Pradesh villages which faced greater risks showed a higher degree of risk aversion than those in Maharashtra villages. Access to institutional credit and participation in insurance schemes reduced the risk aversion to some extent. Among the demographic and socio-economic characteristics, education and assets influenced risk aversion negatively while age and caste index influenced risk aversion positively. Greater investments on education and training of farmers and access to credit and insurance are suggested to reduce the impact of risk aversion on the adoption of improved technologies.

Assessment of Output and Price Risks and Risk Coping Strategies of Riverine Farmers: A Study of North Bank Plains Zone of Assam

R.N. Barman*

Output and price risks are the major components of risks in agricultural production. Because of its peculiar characteristics the riverine areas are more susceptible to both these types of risks as compared to other farming areas. The riverine areas are flat land, surrounded by river waters on one or more sides and are subjected to frequent flash flooding for varying length of time as well as in varying depth. Both time series and cross sectional data were collected and analysed to assess the output and price risks associated with the important crops grown and the risk coping strategies adopted/preferred by the farmers of the riverine zone of the North Bank Plains zone of Assam. The variance and co-variance matrices of output and price disturbances were estimated for the selected crop portfolio. In the riverine areas output risks associated with rice crops (sali and *ahu* rice) were higher as compared to wheat, oilseed crops and *rabi* vegetables. Among rice crops sali rice production involved the highest output risk. A reverse picture was observed in terms of variability of price disturbances where the two rice crops (sali and *ahu* rice) occupied the bottom two positions. This was because the farmers assigned more importance on the production of rice crops considering it as necessary for their livelihood and less importance on the price factor. The price risk was found to be the highest in wheat crop among the selected crop portfolio. As a whole the output risks of various crops were higher than price risks associated with these crops in the riverine areas. Most of the farmers preferred making adjustments in the cropping system to minimise output risks. Despite high output risk, rice being the main foodgrain crop farmers prefer to adopt pre-flood *ahu* rice and post-flood sali rice varieties to minimise output risk due to flood damage (more than 30 per cent farmers in all the riverine villages adopted this strategy). Streamlining the marketing network for wheat, oilseeds and *rabi*

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vegetables are important as these crops are very much price responsive. The significant influence of lagged price on the production of these crops also substantiated the above needs. Forward contract as a mechanism of reduction of price risk was not so popular among the farmers and only about 8 to 12 per cent of farmers entered forward contracts. Development of infrastructures in the form of construction of dams, irrigation devices, storage structures and rural roads were identified as factors to de-risk the production and price risks of riverine farmers. Due to negligence or non-accessibility most of the riverine farmers did not undertake crop insurance as a risk minimising strategy. The relief measures provided by the government in terms of input supply at subsidised rates, flood relief measures, minimum support price for the products were only considered as stop gap arrangements and not as strategies of de-risking the output and price risks. Insurance sectors along with NGO's and government extension personnel need to play a bigger role to make the farmers aware about the crop insurance and government beneficial schemes. Infrastructure development should get priority over initiating post-flood relief measures in the riverine areas.

Integrated Pest Management for Cotton Production in Western Maharashtra – A Risk Minimising Technique

K.S. Birari, V.G. Pokharkar and M.R. Patil[†]

Cotton being a susceptible crop for a number of pests, therefore, it consumes heavy amount of chemical pesticides. The constant use of pesticides leads to its failure in pest resistance and potential hazards to ecology and human health. This has resulted in escalation of cost of production, increase in crop losses and thereby the risk in the production of cotton. The Integrated Pests Management (IPM) is one of the important risk minimising techniques for detecting the economic threshold of pests and diseases for adopting the chemical plant protection measures. The risk due to pest attack on cotton crop can be minimised through IPM technique by reducing the cost on account of chemical pesticides. In view of this, an attempt is made to assess the cost and returns of cotton both for IPM and non-IPM cotton growers. The results of the study based on the data collected from 30 adopters and non-adopters of IPM pertaining to the year 2004-05 revealed that the IPM appears to be an effective alternative to chemical pest control and minimise the risk on the cost of pesticides. The cost of plant protection inputs per quintal of output on the adopter farms was 17 per cent less than the non-adopter farms. The IPM technique adopted by the cotton growers covered the risk in production and yield. Per hectare yield was higher by 11 per cent on IPM farms. The gross returns on IPM adopter farms were 19 per cent higher and even the IPM practice is a labour intensive one. There was gain in net

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income by 39 per cent due to adoption of IPM. The per quintal cost of production of cotton was lower by 10 per cent on IPM adopter farms. Thus, IPM emerges as a risk minimising technique by reducing the cost on account of inputs especially the cost on pesticides of cotton and gaining more per hectare gross returns. The study advocates popularisation of IPM technique, which can minimise the risk in production of cotton and the crops where use of chemical pesticides is more.

Reducing Risk through Crop Insurance in Agriculture of Western Maharashtra

M.N. Waghmare, B.S. Kakad, S.N. Tilekar and D.B. Yadav*

The agriculture sector is subjected to high levels of risk and uncertainties. Crop insurance, market risk management and diversified farming, etc. have been found as effective risk management tools to provide security to the farming community. The Crop Insurance Scheme in Maharashtra covers the crops like cereals, pulses and oilseeds. The scheme has made substantial progress in Pune district, wherein drought is a common feature. The study is based on quantitative information obtained by survey method for the year 2002-03 from the sample of 108 farm families selected from the district by adopting three-stage stratified random sampling design. The sample comprised beneficiaries and non-beneficiary farm families in the crop insurance scheme. It has been observed that the response of small and marginal farmers to crop insurance scheme was relatively more than that of medium and large sized farms. The per hectare use levels of human and bullock labour for insured crops were higher in the beneficiary farms than those of non-beneficiary farms. The productivity levels of all the crops grown on beneficiary farms were higher than those of the non-beneficiary farmers almost by 16 to 38 per cent. Thus, the irresistible response of the farmer to the crop insurance scheme has paid them a good bonus in terms of increased yield levels and returns for the insured crops. The comparison of per hectare gross returns of the insured crops indicated that the participating farmers could get 25 to 48 per cent higher gross returns. The annual family income of the beneficiary group was higher than that of the non-beneficiary group. Crop insurance scheme proved to be the effective solution to avoid the adverse effects of natural calamities. Majority of the farmers appreciated the benefits of crop insurance scheme and made suggestion for removal of existing shortcoming of the scheme. As such, the crop insurance scheme has become an important measure for increasing crop production, improving economic conditions, stabilising income and providing additional employment to the farmers.

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Optimum Farming Systems in Hills under Risk - A Study of Himachal Pradesh

Vinod Kumar, R.K. Sharma and K.D. Sharma[†]

A study was carried out in Mandi district of Himachal Pradesh during 2002-03 to formulate the optimum farming systems in hill agriculture under risk based on a sample of 150 randomly selected households from different sub-ecological regions viz. low-hill region, mid-hill region and high-hill region. The risk efficient farm plans were developed using the Minimisation of Total Absolute Deviation (MOTAD) Model. The plans were existing resources with existing technology, (Plan I) and existing technology with augmented resources (Plan IV). In addition two plans in between these two were also developed. The plans were developed with and without livestock separately. The study revealed that foodgrains occupied commanding position in the existing cropping pattern of the study area. Maize in *kharif* and wheat in *rabi* season were the major crops in all the three regions. The area under vegetables was higher in low hills because of better access to marketing facilities, infrastructure and knowledge. The cropping intensity decreased from low hills to high hills. The optimum farm production strategy chalked out for different regions with crop as well as crop-dairy farming showed that the area under cereals was only up to minimum restriction imposed in the model, thereby indicating their low profitability. The production strategy with crop farming revealed that brinjal and pea (unirrigated) in low hills, soybean and mustard in mid-hills and rajmash and mustard in high-hills were less risky, same was the case for less remunerative crops also during the *kharif* and *rabi* seasons, respectively. The area under these crops was replaced by tomato and radish in low hills, mash and pea in mid hills and potato and garlic in high hills with increasing profit and risk. The farming systems formulated for different regions with crop farming revealed that the expected level of returns to fixed farm resources (RFFR) over the existing level could be increased by 47 per cent in low hills, 43 per cent in mid hills and 32 per cent in high hills. The introduction of dairy into product-mix increased the expected level of RFFR by 39 per cent in low hills, 21 per cent in mid hills and 24 per cent in high hills in plan-IV over plan-I. However, in optimum risk efficient farm systems the introduction of dairy increased the expected level of RFFR by 12 per cent in low hills, 37 per cent in mid hills and 18 per cent in high hills over crop enterprises in plan-I. The introduction of dairy activity reduced the coefficient of variation associated with each level of RFFR thereby indicating its role in stabilising farm income. The analysis of working capital on different regions revealed that crop-dairy farming was more capital intensive than crop farming. The mean absolute deviation increased with the increase in RFFR. To reduce the risk in agriculture different risk efficient farm systems need to be adopted by the farmers

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through government officials. Emphasis must be given to maintain cross-bred cows for stabilising farm income. For this, there is need to establish fodder storage for adequate supply. In addition to this introduction of green fodder trees as well as exotic grass species will also help in fodder availability.

Contract Farming for Agricultural Risk Management: Evidence from Potato in Gujarat

Sukhpal Singh*

Risk in agriculture has been one of the major problems in India and elsewhere. There have been various instruments of risk management like MSP, MIS and insurance which have not gone beyond providing some market risk protection and that too sub-optimally. More recently, there has been policy and research focus on farmers' risk reduction strategies which deal with production (including inputs) risk, and marketing risk (price and market). Under the new agricultural policy, contract farming is seen as an important instrument of risk reduction and is set to be an increasingly utilised model of agricultural co-ordination in India. This paper attempts an analysis of the various channels of marketing of potato in order to identify risk reduction role of contract farming, based on a survey of 81 growers of potato in Banaskantha district in 2006 where the Canadian MNC-McCain Foods undertakes contract farming. It focuses on the production and market risk aspects of primary production with a view to examine the various channels for their effectiveness in reducing such risks. It specifically examines the contract farming operations of McCain Foods to understand risk reduction under contracts. It assesses the performance of contract farming from risk reduction perspective and finds that though contract farming does reduce market risk for growers, but the production risk is not addressed directly. Further, though contract growers had higher net income compared with others, they also faced higher transaction costs. Further, the contracts did not have many risk reduction features. The paper concludes by indicating possible ways to reduce risk in contract farming situations.

Risk Management in Aquaculture

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The study has examined the extent and dimension of risks as well as risk mitigating strategies associated with aquaculture in Bilaspur and Mandi districts of

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Himachal Pradesh. Risks associated with composite fish culture in common water bodies included (a) 'operational risk' such as inadequacy of know-how, (b) 'price risk' involving high growth in input prices vis-à-vis output prices, (c) 'social risks' like poaching, (d) 'policy risk' of non-availability of canal water for fish rearing activity and (e) non-sustainability of benefits due to inadequate maintenance of water bodies through lease rent obtained by the Panchayats. For the purpose of study, extensive field study was conducted in Mandi and Bilaspur districts covering 14 fish farms. The study pertained to the year 2006. The study concludes that the high profit is associated with high risk and aquaculture is no exception. The type and quantity of risk varied across location, activities, farmers, etc. The suggestions on strengthening of linkages including extension education, policy refinements may help for better exploitation of vast untapped natural resources and ensure reasonable income and employment opportunities for fish farmers.

A Risk Analysis of Total Supply of Lentils: Evidence from Saskatchewan

Krishan K. Kaushik*, K.K. Klein, Lawrence Arbenser*** and Sanju Karol***

The study examines and quantifies the changes in the sources of variability in income from Saskatchewan's lentil production using variance decomposition procedures. Production and revenue variability were measured and compared for two time periods using annual data: 1981-1992 and 1993-2004. As a measure of instability, the present study uses relative variability, which is more appropriately measured by the coefficient of "unexplained" variations than by the standard error of the estimate. The variance decomposition procedure is derived from a Taylor-series expansion of the variance of multiplicative identity. The results reveal that the changes in total lentil production and variance of production in Saskatchewan are markedly influenced by changes in area planted and less so for changes in yield per hectare. The change in area, yield covariance and yield variance explains the increasing importance of risk in the area allocation decision. Further, the variance decomposition reveals that the main reason for the decline in revenue variance has been the decline in price variance. The change in the variance of real revenue per hectare is found to be largely influenced by the price dispersion. Accurate quantification of the sources of increased variability can aid target policies to offset the effects of variability.

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Risk Management through Crop Diversification in Hill Agriculture: Evidence from Himachal Pradesh

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The study intends to analyse the degree and direction of diversification of small farms to reduce the risk in the farming business and to investigate its effect on the income of the farmers. The study is based on primary data collected from two revenue villages in Balh valley in Mandi district of Himachal Pradesh relating to the agricultural year 2005-06. Purposive sampling method was followed for the study and a sample of 35 diversified farming households and 15 non-diversified farming households were randomly selected. Herfindahl and Entropy indices of diversification were used to analyse the level of agricultural diversification. The study revealed that the farmers have diversified towards vegetable crops as about 70 per cent of gross cropped area was shared by these crops. This is also corroborated by the values of Herfindahl and Entropy indices. The sample households are doing this to reduce risk in the production process and to attain a higher level of income. The study also shows that the net returns were significantly higher from vegetable crops than the cereal crops. Per household average annual income was higher in case of sample households than the control group households. Diversification has resulted into higher income to the farming families. There is need to support the farmers by providing them extension and marketing services. They should be encouraged to adopt better methods of production and post-harvest management of these high value crops to reduce rural poverty and make the process of development inclusive.

Agricultural Price Volatility and Effectiveness of Commodity Futures Markets in India

Jabir Ali and Kriti Bardhan Gupta*

With global and domestic reforms in agriculture, the Government of India is reducing its direct market intervention and encouraging private participation based on market forces. This leads to exposure of agricultural commodities towards price and market risks, which consequently emphasise the importance of effective commodity futures markets for price discovery, price risk management and efficient market delivery system. This paper examines price volatility of major agricultural commodities at spot and futures markets. The daily basis has been calculated to assess the relative price trends in spot and futures markets. This gives an idea of price

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efficiency in both the markets. This paper further analyses the effectiveness of futures market for major agricultural commodities by assessing the relationship between futures market prices and spot market prices through regression analysis. The results indicate that the high level of volatility in both the futures and spot prices exists for all the selected agricultural commodities. The positive coefficients for all the commodities in different equations highlight the fact that futures prices are indeed effective in hedging the price risk for these commodities.

Extent of Price and Production Risk in Gross Income

Sumit Jain[†]

Indian agriculture is subject to production, price and input risks. In rural India, 70 per cent of population derive their income from agriculture. Due to production and price risks agricultural income is volatile in nature. The main purpose of this study is to calculate the extent of price and production risk in crop gross revenue (or income) risk for ten crops in two periods, viz., period I (1981-82-1990-91) and period II (1991-92-2000-01). The results of the study shows that farmers are prone to both types of risks. The production risk increased for jowar, pulses, cotton and oilseeds in period II compared to period I. The price risk increased for jowar, bajra, pulses and rice in period II compared to period I. In all other crops both price and production risks have declined in period I. Production and price stabilisation policy mix is required only for jowar and pulses, since only in these two crops both production and price risks increased in period II as compared to period I. Almost in all crops price stabilisation policies are necessary but the production stabilisation policies are required only for cotton, and oilseeds. The major reason for increase in price and production risks is the failure of risk management strategies at both farmers and community level. The inefficiency of government's production and price stabilisation policies and inactiveness of private sector are responsible for increase in risks.

Risk Management in Agriculture

Ramesh Prasad Adhikari*

The main aim of this paper is to analyse and evaluate the possibilities of risk-reduction in order to stabilise farm income in arable farming and to describe the alternative ways in which agricultural producers manage risk. An attempt is made to analyse the risk behaviour of the farmers and its relation with the demand for farm credit. The study is based on data collected from a field survey conducted during the

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months of October to December 2003. Primary data were collected from a total of 126 farmers selected randomly from nine Village Development Committees (VDCs) of Morang district of Nepal. All the VDCs of the district were grouped under three states of development, viz., low developed, moderately developed and developed areas. Analysing the risk aversion behaviour of farmers the results of the study showed that farmers were risk averse. Different types of risks in agriculture (such as production risk, financial risk) and ways of reducing these risks are discussed.

Soybean Production under Stress Condition: Can Crop Insurance Avert Risk?

S.B. Nahatkar, P.K. Mishra and B.B. Beohar[†]

In this paper an attempt has been made to visualise the impact of National Agricultural Insurance Scheme (NAIS) as an instrument of risk aversion under stress condition. The primary data for this study were collected from Ujjain district of Malwa plateau zone from beneficiaries (NAIS) and non-beneficiary soybean growers and the study related to the agricultural year 2000-01. In Ujjain district about 34.95 thousand soybean growers received the claims against the sum insured. On an average the small and marginal soybean growers insured 0.51 hectare of area and insured a sum of Rs. 4572.60/ha through payment of Rs. 80.02/ha as premium. The operational cost was Rs. 6220.65 and Rs.5275.75 per ha on beneficiary and non-beneficiary farms respectively and the cost of the crop insurance is only 2.33 per cent of the total operational cost. Although the expected yield levels were higher than the actual average yield, the net gains over operational cost was more than double on beneficiary farms as compared to non-beneficiary farms. This clearly indicates that the insurance of soybean crop under NAIS averted risk of soybean growers under stress condition and also protect the farming community from heavy income losses on account of yield uncertainty due to biotic and abiotic stresses.

Role of Contract Farming in Reducing Production/Price Risks

D.S. Navadkar, R.K. Rahane and A.V. Gavali*

The paper attempts to assess the ground level performance of contract farming and its impact on rural economy in Pune district of Maharashtra. For the purpose of study Venkateshwara Hatcheries Group Ltd. (VHGL) as contracting agency was selected purposively against the backdrop of successful demonstration of contractual arrangements between contracting agencies and the farmers in Pune district of

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Maharashtra. Two villages each from Haveli and Maval tehsils were selected on the basis of concentration of the Contract Broiler Farming activity and 40 contract and 40 non-contract farmers were selected randomly from the two selected villages relating to the year 2006. The yield and price uncertainty ratios were worked out. The contracting firm generally preferred middle aged, educated and experienced farmers. Assured price, market and technology provided by the sponsors were the major motivating forces for adopting contract farming. Comparatively less cost incurred per bird per cycle by the non-contract farmers was due to economies of scale in respect of various critical inputs and apportioning of the cost over more number of birds, per cycle. It was felt that uncertainty could be reduced through better management practices, standardising production practices, judicious and timely input supply and constructive supports extended by the sponsors. Price uncertainty was observed by the contract farmers because of linking contract price with various penalties and unpopular among the contract farmers, particularly on this price-honoring issue. Issues like less mortality, better hygienic conditions, adequate training facilities and effective medication to overcome hyper-disease-sensitive broiler farming along with sufficient and timely supply of quality inputs and credit backed by suitable policy and inter-institutional linkage support, promises better future for contract broiler- farming. Despite, certain constraints, by-and-large, both the contracting parties were satisfied and willing to not only to continue but also to expand the volume of business under contract farming arrangement. The present and potential future problems could be overcome with joint efforts by the member-farmers and sponsors, the banks as well as the Government to make contract farming successful.

State Intervention through Price Policy and Risk Mitigation-A Study of Maharashtra

Sangeeta Shroff and Jayanti Kajale[†]

The Minimum Support Price (MSP) for 25 agricultural commodities is fixed with a guarantee to the farmers that if the open market prices fall below support level, the government agencies would step in and purchase the quantities offered for sale at support price. The cost of production is an important consideration in the determination of support prices. An attempt is made to observe if the producers receive enough support from price policy so as to cover their cost of production in the state of Maharashtra. It was observed that in Maharashtra for major crops in selected years, the cost of production as computed by state Agricultural Price Committee cell was higher than MSP. The study concludes that in the event of price falling below MSP, farmers may not always be able to cover cost of production and that

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Maharashtra is a high cost state. The other measures to mitigate price risk such as futures trading has its own limitations due to predominance of small and marginal farmers and lack of awareness in the modus operandi of trading in these contracts. The National Agricultural Insurance Scheme which can protect farmers in the event of crop failure covers only 14.47 per cent of the farmers while the area covered is 16.99 per cent in Maharashtra. Thus penetration is poor besides the problem of moral hazards and adverse selection. While government price policy and other measures can play only a limited role to provide an assured income to farmers in Maharashtra, the key to maintaining farm incomes is by adopting measures to increase yield through watershed programmes, soil conservation, drip irrigation, Integrated Pest Management strategies, etc., which could also lower cost of production.

A Study of Risk and Shadow Prices of Farm Inputs in Ravine Regions of Uttar Pradesh

R.B. Singh and Sunil Kumar Verma[†]

The study was undertaken in ravine regions of Uttar Pradesh with a view to (i) determine the shadow prices of inputs with and without risk and (ii) examine the relationship between optimum productivity as explained by shadow price and risk. The shadow prices of inputs were estimated from solution values of the 'Dual' to linear programming model with the objective of profit maximisation taking all possible risk and MOTAD model with the objective of risk minimisation. The results obtained from the former model indicated efficiency of resource use under maximum risk while the latter model estimated efficiency of resources with minimum risk. The study of shadow prices of land resources revealed that on group-I farm, the utilisation efficiency of *kharif* unirrigated and *rabi* zaid increased by about 23 times and 15 times in respectively risk-averse plan-III over plan-II. Land being the most scarce resource on group-I farm, the expected gross margin in plan-III and profit maximisation could be attained only through the efficient utilisation of *kharif* irrigated land since these land resources provided higher average gross margin than *rabi* irrigated. The intensive utilisation of these resources increased risk to achieve the expected gross margin in plan-III due to higher coefficient of variation involved in average gross margin from *kharif* irrigated land. The marginal value productivity of *rabi* zaid land resources also remained the highest on group-II farm followed by *rabi* irrigated. The category of farmers were input intensive farms and capable of taking higher risk.

Thus, in order to achieve higher income the preference in utilisation was given to the land resource which involved higher average gross margin irrespective of risk. The optimum marginal value productivity as shown by shadow prices of period-I,

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period-IV on period V on group-III increased by 163 times, 7 times and 9 times, respectively. The study concludes firstly, the shadow prices on input use increased with the rise in risk and expected gross margin in risk-averse plan. Thereby, it shows direct relationship between risk, expected gross margin and marginal value productivity (MVP). Secondly, MVP of resources significantly increased when risk is minimised for the level of expected gross margin similar to profit maximisation achieved through taking all possible risk. Thus, the productivity of resources would increase when a farmer at times, try to avoid risk. However, it varies on different farm size groups, the land resources of *kharif* irrigated on group-I and *rabi* zaid on group-II and groups-III farms are most efficiently utilised. The human labour for harvesting of *rabi* crops and interculture of *kharif* zaid crops in the first fortnight of May has the highest marginal value productivity on group-II farm under optimum solution of risk minimisation. On group-III farm, the high efficiencies of labour use in sowing of *rabi* and *kharif* crops are observed to avoid risk in these operations. In the case of fertiliser nutrients P_2O_5 is fully utilised on group-I and group-II farms. The working capital of *kharif* season and *rabi* season are efficiently utilised on group-I and group-II farms, respectively. This further suggests that with the adoption of risk-averse plans, the shadow prices of resources increase and the inputs are efficiently used.

Response to Risk Management in Agriculture – A Case Study

Lakshmi Dhar Hatai*

Agriculture is a hazardous business of high risk and uncertainty due to its biological and seasonal nature. In the present study an attempt has been made to identify the various responses to risk management in agriculture in the study area. These findings will be of much use to the research system to reorient and prioritise and develop strategies in the thrust area towards risk management in agriculture. Purposive and multistage random sampling technique was used for selection of the district, block, villages and respondents. Dhankauda block of Sambalpur district in Orissa was purposively selected based on maximum area under crops and using the same criteria two villages were selected. A total of 200 respondents were selected randomly for data collection. Primary data were collected using pre-tested and well structured interview schedule and the study pertained to the agricultural year 2005-06. The findings of the study revealed that about 92 per cent of the respondents expressed their awareness about risk. About 192 respondents agreed that agriculture enterprise is a risky business. Nearly 76 per cent of the respondents agreed that, risk in agriculture is minimised at the farm level/household level; while 24 per cent of respondents disagreed on the reduction of risk. Almost 88 per cent of the respondents

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had shown their great concern on the main causes of crop failure in their locality. In the study area, nearly 74.50 per cent of respondents expressed that National Agricultural Insurance Scheme (NAIS) protect the farmers against their crop losses, whereas 25.5 per cent of respondents disagreed against NAIS. The above efforts could have helped the respondents to understand the risk in agriculture in a better way and develop various measures towards minimising the risk in agriculture. The results clearly show that an overwhelming majority of the respondents (90 per cent) agreed that the crop diversification will help to avoid risk in agriculture. Further, it could be noted that 87.50 per cent of the respondents agreed about the adoption of agronomic practices to minimise risk in agriculture. Almost 88.50 per cent of the farmers agreed that insurance is necessary to protect the farmers against their losses. The findings clearly indicated that the respondents in the study area are very much concerned about minimising the risk in agriculture. There is a need for formulating and standardising appropriate techniques to minimise risk in the farming sector for achieving better economic growth in a sustainable way both at the micro and macro levels.

Management of Production Risk in Lac Cultivation through Human Resource Development

Govind Pal*

The study aims to assess the impact of human resource development to cope with the production risk in lac cultivation. The paper is based on the analysis of survey data conducted for 500 untrained and trained lac growers in the year 2003-04 and 2004-05. Primary data have been collected from the respondents with the help of pre-tested schedule/questionnaire. Tabular and average analysis was used for the present work. The lac host trees, namely, *palas* (*Butea monosperma*), *ber* (*Zizyphus mauritiana*) and *kusum* (*Schleichera oleosa*) are commercially exploited for lac cultivation. Variable cost increased by 51.86 and 74 per cent, cost of cultivation increased by 38, 70 and 60 per cent while net return by 67, 114 and 103 per cent in *palas*, *ber* and *kusum* respectively by trained lac growers. Increase in variable cost and cost of cultivation was due to utilisation of more labour and broodlac in lac cultivation by trained lac growers. The cost of production of broodlac and sticklac was reduced by scientific method of lac cultivation in all three hosts. Broodlac production was increased by 57,379 and 330 per cent in *palas*, *ber* and *kusum* respectively by trained lac growers. Higher level of broodlac production resulted in self-sufficiency in broodlac and more utilisation of host trees for lac cultivation as shortage of broodlac has been identified as a major constraint in lac cultivation. There is need for strengthening and widening the extension activity so that majority

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of lac growers can be empowered with scientific knowledge on lac cultivation to reduce the production risk in lac cultivation which will ultimately increase the income and employment generation at farm level.

Risk Analysis and Management in Agricultural Production – An Experience of Majuli, the Largest River Island of the World

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Risk is inherent in every form of enterprise, but its intensity in input-output relation in agricultural production is comparatively high. Majuli is the biggest river island in the world. Floods occur in this river island almost every year with several waves, which causes severe land erosion making the land unproductive and infertile besides damaging standing crops. The present study was taken up in Majuli to analyse the nature of instability in the existing agricultural production system, the risk coping mechanism and possibilities of minimising risk and maximising expected income under risky environment through appropriate analytical tools. Both primary and secondary data have been used in the present study. Rice was the major crop and duckery was the main livestock enterprise among the sample farmers. Animal activities maintained in farms in flood prone areas like Majuli helps not only in stabilising farm income but also helps in minimising risk to a great extent. Among the field crops summer rice appeared as the most risky crop. But crops like papaya, tobacco though riskier yet the areas under these crops are rather low. The *ex ante* risk coping mechanisms adopted by the sample farmers in the study area include crop diversification, seasonal crop diversification, varietal diversification, temporal adjustment, and income diversification. *Ex post* mechanism adopted by the sample farmers are selling of animals, implements, and other assets to cope with the losses after flood. Risk minimised optimal plans have been developed for marginal size group of farms using Hazel's MOTAD algorithm to examine the effect of risk on cropping pattern since the marginal farms are comparatively more as compared to other farm size categories in Majuli. It was observed that as the level of expected net returns and risk increased, the total cropped area also increased with risky crops occupying more areas in the plains. Among the livestock enterprises, cow was found to be the most remunerative animal activity. In the case of employment of human and bullock labour after relaxation of capital and labour supply there has been marginal increase in the level of employment. The results of the study showed direction for resource use for minimising risk at various levels of net returns. The results obtained in this study may provide a broad basis to the policy makers for formulating any improved policy regarding farming practices in the flood prone areas of the state.

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A Study of Risk Management in Marketing of Potato in Ghazipur District, Uttar Pradesh

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The risk associated with marketing cannot be dispensed with for the risk contribution, to profit someone has to bear the risk in the marketing process. But most of the risk is taken by market middlemen, for they have the capacity to bear it. There are three types of risk in marketing of potato (1) physical risk, (2) institutional risk and (3) price risk. The physical risk management can be undertaken by use of improved storage structures and giving necessary pre-storage treatment to product to prevent losses in quantity and quality arising out of excessive moisture, temperature, attack by insect and pest quick transportation method and proper handling during transit, transfer of risk to insurance companies. The management of price risk operation of speculation can be done by hedging and futures trading. The price risk associated with the potato for which the facility of forward trading is available may be transferred to professional speculator through the operation of hedging. Fixation of minimum and maximum price of potato by the government and allowing movements in price only within the specified range and an effective system of advertising are needed. The different channels used in marketing of potato in Ghazipur district are (1) Producer - consumer, (2) Producer - retailer-consumer, (3) Producer - wholesaler - consumer, (4) Producer - village merchant - wholesaler - Retailer - consumer. In the case of marketing of potato, the producer received low share of consumer price in channel - III than channel II. Moreover, in channel IV the producer's share's in consumer's price was marked the lowest as compared to channel-II and III. In channel-IV the marketing margins received by the wholesaler and retailer were lower as compared to channel-III. The marketing efficiency for marketing channel II, III and IV were 5.94, 4.73 and 4.18 respectively. The index of marketing efficiency was higher in channel II than channel III and IV.

An Estimation of Variability in Production and Adoption Pattern of Crucial Inputs in Dryland Area of Haryana

Pawan Kumar, V.P. Mehta and D.P. Malik[†]

About 90 per cent of coarse cereals and pulses, 81 per cent of oilseeds and 69 per cent of cotton are grown under rainfed conditions in India. Improvement of dryland farming is a key to the development of agriculture and removal of poverty in rural areas. The present study was undertaken with the following objectives (i) to study the

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variability in area, production and yield of principal crops, (ii) to analyse the factors influencing agriculture production and (iii) to examine the constraints in agriculture production. Mohindergarh district was purposively selected from dryland region of Haryana to collect information pertaining to constraints in agriculture production. The information pertaining to area, production and yield of pearl millet, wheat, chickpea, other pulses, rapeseed-mustard and other oilseeds, cotton (American and desi) were scanned from published sources for the period 1981-2004. The information related to total cropped area, fertiliser consumption, price index, gross irrigated area, co-operative credit, average rainfall and number of tractors were also collected for the same period. The coefficient of variation was employed to examine the variability in area, production and yield of the principal crops. Further, to analyse the factors influencing agricultural production, the study considered the index of agriculture production as the endogenous variable and total cropped area, fertiliser consumption, price index, gross irrigated area, co-operative credit, average rainfall and number of tractors as exogenous variables and multiple regression equation was used. The results revealed that the estimated coefficient of variation exhibited least area variability in pearl millet (11.85 per cent) because of non-availability of suitable substitute for pearl millet crop. The amount of variation in acreage of pearl millet and chickpea was the highest in period-II due to severe drought condition in the year 1987-88. The variability in wheat area was almost at low level due to expansion in irrigation facilities in the study area. The highest variation in yield of pearl millet, chickpea and wheat was observed in period-II due to higher acreage variability of these crops in rainfed area and severe drought spell in the year 1987-88. The yield variability of rapeseed-mustard in period-I was obtained due to introduction of sprinkler irrigation system and use of chemical fertilisers, while higher variability in yield of cotton (desi) crop in period-V accrued because of severe incidence of American bollworm. The production variability for pearl millet and chickpea was the highest in period-II as a result of higher variation in acreage and yield of these crops. The variation in production of cotton (desi) was higher in period-IV due to higher acreage variability and yield per hectare. The exogenous variables like price index, gross irrigated area and co-operative credit contributed the maximum and have significant impact on the agricultural production index. There exist substantial attainable yield gaps in cotton, pearl millet, chickpea, wheat and mustard reflected by the difference in the yield obtained by progressive top 20 per cent and bottom 20 per cent of the sample farmers. This gap can be bridged through adoption of improved production technology and better management practices.

Market Risk Management in Agriculture

Shrikant S. Kalamkar*

An attempt has been made in this paper to look into the prospects of contract farming and futures trading in India towards market risk management in agriculture. The biological nature of farm enterprises entails some uncertainties in their production and prices, coupled with uncertainties of availability of inputs. The farmers generally face five types of risks in farming, viz., production risk, price or market risk, financial risk, institution/policy risk and resource/human risk. Instability of commodity prices has always been a major concern of the producers as well as consumers in an agriculture dominated country like India. The uncertainties due to price fluctuations of agricultural commodities hamper economic growth and are associated with accentuating poverty among the farming community. The situation is likely to be exacerbated further in the wake of integration of agricultural trade in the global system. As a result, prices of agricultural commodities are determined by market forces (domestic market and import), and fluctuating demand and supply of agricultural commodities is expected to result in high price risk for agribusiness. Price supports have been the principal means by which Indian farmers have received some protection against market risks, however, it has limitations as well. Contract farming and forward markets are the most convenient and safer options, which comes to the rescue of not only the small and marginal farmers by reducing price risk through guaranteed income and low capital investment but also the nation as a whole making it globally competitive and thus encourage the Indian farmers to compete with the very large, rich and highly subsidised western farmers. Also, the contract farming system and futures markets forms the most heartening part of the vision of the National Agricultural Policy 2000. Contract farming can serve as a mechanism to reduce the market and income risks faced by the farmers when diversifying away from food crop to new commodities. The studies of contract farming show that the farmers agreed that contracting help them better farming, have more reliable income, zero price uncertainty and less production risks, provided new skills of farming and generated employment especially for women. Commodity futures can also potentially play a very crucial role in the price risk management process. Theoretically, it allows farmers to hedge against market risks, however, transactions cost is a formidable barrier to the participation of farmers in futures markets and also it suffers from lack of liquidity. Their performance in insuring spot prices is also suspect because the basic risk from futures trading is high relative to spot price risk. The government can foster the development of contractual arrangements by facilitating the creation of producer organisations, legislating an appropriate contract law and enforcing it effectively, strengthening and improving the quality of

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agricultural extension services both public and private by providing complementary infrastructure, and developing effective land administration systems.

Role of Futures Trading in Mitigating Risk in Agriculture

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The paper attempts to study the functioning of futures trading in agri-commodities in India and as a tool for risk mitigation in agriculture from the perspective of all participants of agri-supply chain. Based on the study conducted in the country capital on futures trading of agri-commodities, and responses received from exchange and broking firms' representatives and traders/participants of futures trading, it was observed that futures trading can be used as risk mitigating tool but only if some structural and functional changes are brought about. The producers face a spectrum of risks, which along with how they are managed, impact farm income and productivity. While price risk management instruments cannot deal with all of the risks, they provide a means for managing one of the biggest of these risks: the volatility of prices over the course of the season. Well functioning commodity exchanges systems of price risk management improve marketing efficiency for agricultural products, and open up new production and marketing opportunities to producers. They reduce price risk by improving overall market liquidity, enhancing stability of local trading networks, and by providing farmers with more certainty of expected futures prices upon which they can make better managerial decisions. But all this is possible only if all the participants of futures trading get accurate information and support of policy makers. There is a wide gap between spot and futures prices which makes it inefficient for producers to hedge their price risk. Also small traders or producers are not able to utilise this platform because: the minimum contract size traded on organised exchanges far exceeds their annual production quantity, there is lack of knowledge and understanding of how to use the tools available, technical and logistical limitations, various policy and regulatory controls. If this market works with transparency and regulations of FMC as strict as of SEBI then, this can be a model/price risk management instrument which can provide producers with certainty about the minimum price they will receive for their crop, and allow them to make more efficient farm management decisions regarding output mix and input use. Elimination of worst price scenarios can provide incentives for investment in promising sectors (that are often high risk/high return) and reducing market distortions foster diversification to new and more profitable agricultural enterprises. The study shows that the futures market in agri-commodities are not efficient in the sense that the futures prices are not an unbiased predictor of the

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futures ready rates. The Exchanges and FMC need to make futures trading more transparent and convenient for farmers/producers to effectively use this platform for mitigating their price risk.

Futures Trading and Risk Management by Farmers: A Perspective

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Risk and uncertainty are integral to the production environment in agriculture. Price uncertainty is a normal feature of farming. Production decisions have to be taken well in advance of realising the final product. Market prices are not known at the time these decisions have to be made. The consequence of incorrect anticipation can potentially ruin the farmer. Minimum support price schemes by the government is one of the ways by which Indian farmers are protected against market volatility. Futures trading is another way through which farmers can have insulation against price volatility. Futures trading has been revived in India recently. There are three national exchanges and several regional exchanges and large number of agricultural commodities are traded in these platforms. There are a number of way futures contracts can be used in marketing agricultural commodities. Futures contracts can be a temporary substitute for an intended transaction in the cash market that will occur at a later date. Theoretically it is possible for the farmer to hedge against price risk using futures contract. However, farmers generally do not participate in futures trading even in advanced countries. It is unrealistic to expect farmers in India to use futures as a tool of risk management. This is mainly because of lack of know how, lack of collateral for margins, small scale operations and cumbersome nature of hedging transactions to administer. It is often suggested to have an aggregator who pools the requirements of the farmers a sufficient scale for hedging. The role can be played by a co-operative or NGO or farmers association. Though the proposition seems attractive it has its own set of constraints. So, at best farmers may only benefit indirectly in terms of price discovery because of the existence of futures trading rather than use it for risk management.

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