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Synthesising Investment Initiatives for Horticulture Sector in India: A Crucial Component for Agricultural Growth

Deepak Shah*

The study attempts to address the various issues relating to horticulture sector of India with particular reference to evaluating diversification of agriculture, marketing of high value crops, and the extent of investment made by various agencies over time towards creation of post-harvest infrastructure (PHI) related facilities for these high valued crops across various states in India. The study reveals that India's growth in agriculture sector in the near future will depend mainly on the extent of infrastructure development in the horticulture sector. In spite of the efforts and initiatives undertaken by the National Horticulture Board (NHB), National Co-operative Development Corporation (NCDC), Agricultural and Processed Food Products Export Development Authority (APEDA), National Bank for Agriculture and Rural Development (NABARD), commercial banks, and other funding agencies to create proper and adequate post-harvest infrastructure for horticulture crops, the development of PHI related facilities in horticulture sector has not been impressive so far, mainly because of huge capital investment required to develop this sector and curb the losses emanating from post-harvest operations. The cumulative assistance sanctioned by these agencies for PHI related facilities hardly works out to Rs. 3,000 crores, accounting for 10 per cent of the actual investment required to develop PHI related facilities for horticulture sector of India. However, the policies initiated in the early 2000s and various programme initiatives undertaken in more recent times by the NHB, NCDC, APEDA, NABARD, Food Processing Industry, and other agencies engaged in developing PHI related facilities for horticultural crops, and also private sector investment in horticulture have certainly given a fresh fillip not only towards expansion of the horticulture production base of India but also to the exports of these high value products from the country. The goals set forth by these agencies for the growth and development of horticulture sector in India are truly worth emulating and a heartening feature indeed.

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Cashew Production and Processing: Livelihood Opportunities

Shalini Yadav and S.L. Kumbhare[†]

Cashew has substantial potential for generating gainful employment and revenue through production, processing and marketing within and outside the country. Cashew processing provides an important source of wage employment for rural women and also self-employment through micro enterprises. Besides the trends in area, production and yield of cashewnuts in selected states, the paper analyses the economics of cashew cultivation and the experience of Tamil Nadu Forest Plantation Corporation Limited (TAFCON) in public-private partnership, economics of cashewnut and Cashewnut Shell Liquid (CNSL) processing, potential for cashew apple processing and value added nuts and identifies the issues in cashew cultivation and processing in Cuddalore district of Tamil Nadu. The compound annual growth rate in area and production under cashew has been positive in all the States except Kerala, which is mainly due to the replacement of cashew with remunerative crops like rubber. Financial rate of return exceeded 30 per cent for replantation and grafted varieties of cashew, despite high cost of investment at Rs. 77,700 and Rs. 1,93,950. This suggested the scope for financing them through credit institutions. Credit plus approach comprising loans and strong extension activity is required to make the farmers rejuvenate senile plantations as well as to practice intensive cultivation practices, besides promoting organic cashew. Farm Science Clubs as organised by the Krishi Vigyan Kendra may be encouraged in public/private sectors for dissemination of technologies to the farmers. Besides taking up cultivation on a commercial scale, the cultivation can also be taken up in non-traditional States in order to reduce the dependence on imported raw nuts. TAFCON successfully attempted public-private partnership for the development of forest crops including cashew. Cashew apple preparations need to be popularised and commercially exploited, so as to increase the income of cashew cultivators and also enhance rural employment.

Enhancing Farmers' Linkage to Markets

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An attempt is made to investigate the (i) structural transformation of agri-horticultural produce markets, (ii) barriers to market access by various producers-growers in marketing of their produce and (iii) illustrate the case of alternative

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marketing arrangements, i.e., how terminal markets enable producers-growers to overcome the barrier to effective participation in the market for disposal of horticultural produce. The study utilises data collected by National Institute of Agricultural Marketing for preparing detailed project reports for establishing terminal market in various states. The study highlights that in India, many producers-growers face barriers to effective participation in markets for disposal of fruits and vegetables. These problems and lack of basic infrastructure aggravate the sufferings of farmer-growers by realising unremunerative prices. This calls for corrective measures and working out an alternative model of marketing of horticultural produce. Terminal market is one such alternative model which offers one stop solution to all the problems of marketing and link the producer-growers to market. The study suggests speedy development of terminal markets in India. In order to link farmer to market more effectively and enhance their participation in growing horticulture, there is need to identify suitable entrepreneurs who are conversant with the idea, have zeal and money, a risk averse attitude and a vision. Such type of investors will not only fill that gap, and invest in the ideas of others but would help them in achieving their objectives. Apart from investing money, providing assistance in the execution of the business plan, building a network of reliable and resourceful contacts for their disposal of horticulture produce and even providing them timely guidance would go a long way in linking farmers to the markets and enhancing horticulture production in the country.

Contract Farming in Two Horticultural Crops: A Transaction Cost Perspective

S.R. Asokan[†] and Anita Arya[‡]

Indian agriculture witnessed a tremendous change in the last half century or so. The change was brought about not only by technology such as green revolution but also through institutional interventions in delivering farm inputs and marketing of outputs. Contract farming is another institutional innovation that is being advanced to address the problems which still plague the agriculture sector. However, while in some crops the arrangement has been working smoothly for many other crops some problems have been observed in the relationship between the firm and the farmers. Many arrangements after a promising beginning turned into disappointments and were abandoned. Although there were several studies on contract farming in India there is hardly any study which systematically investigated contract farming from an institutional perspective which would provide clues to understand the reasons for success or otherwise of contractual arrangement in procuring agricultural produce. The objective of this paper is to try and identify the factors that contribute to the smooth functioning of the contractual relationship between the firm and the farmers.

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This is done by examining two cases of contract farming in horticultural crops – gherkin in Karnataka and tomato in Punjab. The data for the study were drawn from the case studies of other scholars and try to seek explanation under the institutional economics framework. It was found from the two case studies that asset-specific investment for a particular transaction determines the endurance of the relationship. If one party had made asset-specific investment whose alternative uses are limited, the other party behaves opportunistically to extract maximum advantage. However, if both the parties are locked in asset-specific investment the relationship is smooth. They become hostage to each other which ensures that the contract is self enforcing. Therefore, instead of blindly harping on contract farming as a solution to some of the ills of Indian agriculture it should be acknowledged that it could be successful only in certain circumstances.

Price Behaviour in Fruits and Vegetable Markets: Cointegration and Error Correction Analysis

A.K. Vasisht*, Seema Bathla, D.R. Singh*, S.P. Bhardwaj* and Prawin Arya***

The paper builds on the hypothesis of higher spatial price convergence and makes an attempt to empirically analyse the magnitude of price variability and integration that has taken place across the state level fruit and vegetable markets in India. Time series data on wholesale prices during the period 1998-2006 of two important fruits (apple and pineapple) and vegetables (potato and cauliflower) were used for examining the intra year price variations using three important measures, namely, the Intra Year Price Rise, the coefficient of Average Seasonal Price Variation, and the Coefficients of Variation. The price relationships across the markets are studied within a framework of Augmented Dickey-Fuller and Johansen multivariate cointegration and error correction model. The empirical results on the price behaviour provide evidence of high volatility in the prices of these commodities in major markets. There is a presence of long-run relationship across some of the state level markets for less perishable commodity like apple. For highly perishable commodity like pineapple, price integration is very weak and indicates its presence only among a very few markets. In the case of potato the results are not consistent with the expectations, as the price integration is also very weak. The partial and limited evidence indicate that the long run relationship and short run dynamics are better for commodities having better shelf life like that of apple. The findings obtained in this study clearly indicate that the horticulture sector in India can thrive for greater benefit of both producers and consumers only if better infrastructural facilities like cold storage, refrigerated trucks/vans for transportation, modern marketing infrastructure

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etc., as well as timely availability of market information, and better market intelligence, etc., are developed fast across all the states.

Export Performance of Cardamom in India during Pre- and Post-Liberalisation Periods

U. Arulanandhu, T. Alagumani, and T. Samsai[†]

Indian agriculture has to face competitiveness in international trade due to liberalisation. Cardamom is one of the spices traded internationally. In recent years, its export showed fluctuating trend. Hence, the present study was carried out with the following objectives; (i) to measure the export performance, (ii) to forecast the export, (iii) to find out the factors influencing export and (iv) to identify the constraints on exports and to formulate suitable policies. The study is based on secondary data on annual export quantity, value and unit value and primary data collected from 30 cardamom traders randomly selected out of 150 traders in Bodinayakamu, Tamil Nadu. Percentage analysis, compound growth rates, Coppock's instability index, ARIMA models, Conjoint analysis and Garrett's ranking techniques were used for the analysis. It was found that the compound growth rate of export of cardamom (small) was positive during post-liberalisation period whereas it was negative during pre-liberalisation period. Though the export of cardamom (large) had increased to 1077 tonnes in 1990-91 from 60 tonnes in 1970-71, the compound growth rate was negative during post-liberalisation period. This is due to high export upto 2002-03 and declining trend thereafter. The instability index showed that liberalisation had stabilised the quantity exported. The unit value for both small and large cardamom was found to be stable in both the periods. The forecast export quantity showed declining trend which would be only 603 tonnes and 898 tonnes for cardamom (small) and (large), respectively during 2010-11. The important quality attributes preferred by cardamom-small traders are AGEB variety, >8 mm size, fancy green colour, and high aroma. Price fluctuation was the major constraint followed by lack of demand forecasting. Based on the results of the study, it is suggested to increase area by planting new varieties. Change in method of auctioning, provision of adequate storage facilities and fixing standard/trader's price as followed for other spices to control price fluctuations and by trade promotion measures India can increase the cardamom exports.

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Trade Liberalisation and Export Performance of Horticultural Sector in India

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The study presents a comparative analysis of horticultural sector scenario in post-reform period; choice of period for the analysis becomes crucial because in India trade liberalisation, in the real sense began after 1991. The study is based on time series data since 1991. It analyses the performance of various horticultural products. Variability in exports of horticultural products is analysed through Coefficient of Variation (CV). Compound Annual Growth Rate (CAGR) was estimated using the exponential regression model to examine the growth trends in the exports of various horticultural products. The study also measures the Export Performance Ratio (EPR), as suggested by Balassa (1965) to measure the Revealed Comparative Advantage. The share of exports from horticultural sector in total agricultural exports has increased from 5.32 per cent in 1990-91 to 9.05 per cent in 2005-06. The share of agricultural exports in total merchandise exports has decreased continuously since 1996-97. The estimated annual compound growth rate of total merchandise export registered the highest growth rate followed by horticultural exports, agricultural exports during the period 1990-91 to 2005-06. India's share in world horticultural exports increased from 0.59 per cent in 1991 to 1.59 per cent in 2005. The share of vegetables in total horticultural exports of India was the highest followed by onion, fruits, grapes, mangoes and banana in 2006-07. India enjoyed comparative advantage in the export of mango, onion, fruits, vegetables and horticulture during the period 1991-2005 but lacked comparative advantage in the export of banana. The study showed that the exports of Indian horticultural products in value terms have increased considerably in the post-reform period, but still the share of India's horticultural trade is negligible. Among all the products the three major products, i.e., onion, mango and grapes dominated the trade scenario of horticultural products during post-liberalisation period. The share of India's mango and onion export in world has shown promising signs in 2005, indicating that liberalisation has provided favourable environment for enhancing India's potential in horticultural sector trade.

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Horticulture Production in India: Growth, Determinants and Its Impact on Income and Employment

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In the green revolution period India's agricultural growth was due to the supply driven factors, but in the post-reform period the demand driven factors are the driving forces. Urbanisation, increase in per capita income and changing consumer tastes and preferences have largely shifted the consumption demand from food grains to high value commodities. This calls for the policy support to diversify the agriculture from the traditional low value crops to these high value commodities. Keeping this in background, this paper attempts to examine the trend and growth of high value horticulture production among the Indian states, factors explaining the production of these high value crops, and how horticulture production is affecting employment and income. The study is based on 15 years panel data for the 15 major states of India which together comprise about 94 per cent of total population and 87 per cent of total land area of the country. Compound annual growth rate, applying regression technique, is calculated to observe the growth of production of these crops. Fixed effect panel regression is carried out to examine the factors affecting horticulture production. Random effect model is applied to examine the role of horticulture production on employment and income.

A Comparative Analysis of Production, Consumption and Exports of Food and Horticultural Commodities in India

Arvind Awasthi*

The paper examines whether the issue of triggering agricultural development through horticultural crops acts as a viable policy option or not by analysing three important aspects, namely, behaviour of actual production of food and horticultural crops in relation to its trend, domestic consumption and production of both food and horticultural commodities and inter-temporal change in the percentage share of food and horticultural products in total value of agricultural exports. The analysis of the three issues on the basis of available evidence suggest that any attempt to trigger agricultural development through horticultural crops may create imbalance in the demand and supply of foodgrains as well as in the case of horticultural commodities through re-allocation of area between the two. Moreover in the light of the fact that there is an improvement in the share of foodgrains as against a decline in the share of

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horticultural products in total value of agricultural exports during the last 15 years certainly do not strictly support the view point about triggering agricultural development through horticultural crops.

Value Addition in Mango Processing for Pulp in South Konkan Region (Maharashtra)

V.G. Naik, J.M. Talathi and S.R. Torane[†]

The study was undertaken to study the economics of investment profitability in pulp production and value addition in processing of mango for pulp. For the purpose of study, a list of all mango processing units was obtained from the office of Deputy Director of Horticulture and 15 processing units from each district was selected randomly. The data was collected by survey method for the processing year 2002-03 from the selected factory owners. The business of mango processing for pulp making was found to be quite remunerative. It required large capital investment of Rs. 19.28 lakhs of which only 18 per cent was fixed capital and 82 per cent was working capital. At the overall level out of Rs. 16.28 lakhs as working capital, 79 per cent was shared by raw material alone which mainly included purchases for mango processing. The mango pulp making factories were to be working for 48 days in a year. The benefit-cost ratio in mango pulp production was 1.62 at overall level. per tin ex factory cost of processing was Rs. 42.83 for mango pulp making with gross returns of Rs. 69.21 and net returns of Rs. 26.38. There was inverse relationship with scale of production. The major problems faced by pulp making factory owners were high prices of raw material (fruits), inadequate supply of fruits in the beginning of season, shortage of labour during peak period of processing, high prices of tins and erratic power supply, high transportation and marketing expenses. The whole analysis revealed scope for further expansion of these capital intensive agro-processing industry for value addition in mango fruits.

Economic Analysis of Crop Diversification: A Comparative Study of Foodgrain and Vegetable Crops

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The present study attempts to examine the comparative advantages of food grain and vegetable crops on marginal, small and medium size of operational holdings. Fifty two farmers consisting of 20 marginal, 20 small and 12 medium farmers were

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selected randomly from two villages of Khijri block of Ranchi district, Jharkhand. The results of the analysis revealed that the area under foodgrain crops was considerably higher on all categories of farmers. However, the share of vegetable crops in total cropped area was significantly high on marginal farmers in respect to medium farmers. There was no significant change in the average yield per hectare of foodgrain on various farm sizes. Although the marginal and small farmers were more efficient in respect to medium farmers on producing quantities of vegetable per hectare. The average cost of cultivation of foodgrain per hectare was lower than that of per hectare cost of cultivation of vegetable crops for all categories of farmers. The study further revealed that the gross income per hectare of vegetable crops was more than 2.5 to 3.0 times higher than that of gross income per hectare of food grain. The maximum net income was observed in wheat crop in foodgrain crops on all farm holdings, while in vegetable crops, maximum net returns was obtained in potato cultivation on all farm holdings. The comprehensive study also indicates that the net return of vegetable crops was four to five times higher in comparison to food grain crops on all categories of farms. The study also indicates that large farmers were more efficient in the production of foodgrain crops, while marginal and small farmers were found to be more efficient in vegetable production. The labour employment opportunities revealed that vegetable crops provided more employment than that of food grain crops on all farms. It is concluded from the analysis that through crop diversification from foodgrain to vegetable crops, farmers would be able to increase their income, sustain it and also be in a position to create effective aggregate demand and employment opportunities in crop production.

Diversification of Agricultural and Horticultural Crops: An Increase in Income and Employment of Rural Farmers in District Kannauj Uttar Pradesh

Babu Singh, Ajay Kumar, Rakesh Kumar Singh and Bhupendra Kumar[†]

The main objectives of the paper are (i) to study the farm structure and cropping pattern of households in Kannauj district of Uttar Pradesh, (ii) to study the comparative advantage of different enterprises adopted by the farmers and (iii) to work out the effect of diversification on farm holdings. The data on information relating to family profile, land holding, cropping pattern, labour used and income from different farm enterprises were collected from 50 households through personal interview during the agricultural year 2004-2005. The study indicated that the linkage between crop composition and economic performance of crop enterprise does justify the rationale for crop diversification as a strategy for improving the economic prospects of farmers. The case for uplifting marginal and small farmers by diversifying their vegetable crop production should be fully explored both as an

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immediate and long term strategy. Diversification of agriculture under Indian conditions may be supported by considering the four main objectives as (i) the imperative to increase the income and employment of farmers, (ii) the need for higher employment in the farm household, (iii) stabilisation of farm income over the season and, (iv) conservation and enhancement of natural resources. Poverty of these rural households can be eradicated through the diversification of horticultural and agricultural crops.

Change in Cropping Pattern and Present Status of Horticultural Crops in West Bengal

B.K. Bera*

The study attempts to examine the change in cropping pattern of West Bengal for the period 1970-71 to 2004-05 with a view to highlight the extent of commercialisation of the state agriculture through introduction of horticultural crops to meet the growing needs of green vegetables and fruits and nuts in the domestic as well as international markets arising out of increase in per capita income and rapid urbanisation and also due to the opening up of the Indian economy. The study reveals that the area under *aus* and *aman* paddy showed a declining trend when measured as a percentage of total cropped area, but the remarkable increase in *boro* area failed to compensate the gross decline in area under total cereals and landslide decline in pulses forced area under food grains to drop down in the same measure, on the other hand, the area under horticultural crops increased in the successive decades. The study of index number of area under different crops showed faster rate of increase in area under horticultural crops compared to cereals for the same period and the percentage change in area of cereals as well as vegetables and fruits during the period 1970-71 to 2005-05 indicated that in spite of a decline of net sown area by 1.9 per cent the total cropped area has grown by 32.42 per cent which has helped the state to improve the cropping intensity by 46.37 per cent and the percentage increase in area under vegetables and fruits witnessed a galloping acceleration by 136.3 and 117.3 respectively leaving far behind the increment in area under total cereals. In the case of production also, the increase in production of vegetables and fruits was found to be greater than that of total cereals during the period 1991-92 to 2003-04. State – wise position of area and production of vegetable and fruits and nuts discerns that the rate of increase in area and production of vegetables is far behind some southern, western and eastern states, but higher than all India average and in case of fruits also, the status of West Bengal is found to be same as that of vegetables but higher than the India average in terms of area and lower in terms of production. The annual compound growth rate of area, production and productivity of vegetables of major

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states of India shows that West Bengal is the only state which shows a positive growth rate in all aspects and in case of fruits except productivity (negative), growth is positive in area and production during the period 1991-92 to 2004-05. In terms of area allocation and production of fruits and nuts, West Bengal is found to be surplus along with India in both these two periods. But if the total requirements fruits of almost 25 per cent of the total population of India living below poverty line is deducted from total requirement, India may not be deficit in vegetables production and this surplus production of fruits will be higher than estimated as they have no access to this fruits market. This minuscule deficit in production of vegetables and huge surplus production of fruits failed to improve the economic conditions of farmers due to inefficient marketing system dominated by middlemen who took the lion's share of the produce, inadequate infrastructure facilities, lack of market intelligence and information system stands as stumbling block and deprives farmers to reap the remunerative prices for their produces and also impede them to exhaust the opportunity created in the domestic as well as international markets due to globalisation of Indian economy.

Agricultural Growth and Diversification in Tripura: Concerted Performance of High-Value Horticulture Crops

Moloy Kanti Roy, Debdutt Behura and Arunoday Saha[†]

An attempt has been made in this paper to examine the transformation pattern from traditional agriculture to high-value horticulture crops, in Tripura State, growth rates of area, production and productivity, variability in yield and dynamics of production of major agriculture and horticulture crops in the state over the years and their relative prospects. There has been a significant change in the cropping pattern of Tripura during 1985-86 to 2005-06. The area under total rice which was 2.69 lakh hectares during the triennium 1985-86 declined by 13.2 thousand hectares during 2003-06 along with decline in total food grains area. Total area under agricultural crops declined by 27.14 thousand hectares where as, the area under horticulture crops, viz., vegetables, potato, fruits, nuts, spices and plantation crops especially rubber increased extraordinarily in Tripura state during the period. The area under total horticulture crops also increased by 79.5 thousand hectares during the period. Decreasing trend in area in case of agricultural crops and increasing trend in case of horticulture crops to the share of gross cropped area gives the clear signal of crop diversification in the state. Significant negative growth trend in area is observed in the case of major agriculture crops. On the contrary, significant positive growth trend

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in area is observed in case of major horticulture crops. The yield variation is tapered in case of agricultural crops where as, it is wider in case of horticulture crops but the mean yield increased in both the crops. Yet, the farmers of the state have already started diverting traditional agriculture lands to high-value horticulture crops due to price responsive market. So, in order to accomplish the *Perspective Plan n Agriculture* to attain self-sufficiency in food grains by 2009-10 in Tripura, special attention should be given to specific groups of foodgrains, particularly rice producing farmers to increase the productivity and in turn their income level to attract and settle them to food grains production. Infrastructural facilities like storage and processing of fruits, vegetables and rubber will encourage the farmers to export and increase crop diversification towards high-value crops and will raise the farm income in the state.

Marketing of Onion in Indore District of Madhya Pradesh

A.R. Verma*

An attempt is made in study to estimate the various marketing costs and margins and the onion grower's share in the consumer's rupee, marketing efficiency of onion and the problems faced by the onion growers in the marketing of onion in Indore district in Madhya Pradesh and sale in the vegetable mandi of Indore city. Multi-stage random sampling technique was used to select a sample of farmers from four villages in Indore block of the district. The data pertained to the agricultural year 2006-2007. Ten wholesalers/commission agents and ten retailers were selected randomly from the regulated market prevalent in Indore 'Vegetable Mandi' where maximum quantity of onion is sold by the producers. The study revealed that the onion growers in the study area sold their produce through three marketing channels, viz., Channel-I: Producer-Consumer, Channel-II: Producer-Retailer-Consumer and Channel-III: Producer-Wholesaler-Retailer-Consumer. The marketing cost was the highest in Channel III, followed by Channel II and I. The per quintal cost of marketing of onion incurred by producer sellers was the highest in Channel III, followed by Channel II and I. The producer received the maximum share of consumer's rupee in Channel-I followed by Channel-II and Channel-III. The highest share in consumer's rupee was obtained by the farmers in Channel-I as there was no intermediary between producers to consumer. In second channel, the producer received only 81.85 per cent of consumer's rupee and retailer received 7.23 per cent of consumer's rupee. In the third channel, the farmers received still less, i.e., 68.94 per cent of consumer's rupee. The share of wholesaler and retailer were 3.59 and 7.17 per cent of consumer's rupee, respectively. The producer's share was less in Channel-II and III as producers were located at a large distance from market place. The intervention of market

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intermediaries has reduced the producer's share in consumer's rupee. The marketing efficiency is inversely related to the total costs and margins. As the number of intermediaries increased, costs and margins increased and inverse was the marketing efficiency. It is evident from the study that inadequate storage facilities and lack of organisations like co-operative societies and lower price due to seasonal glut are the main problems faced by the onion growers in the study area. High cost of marketing and transportation are also some of the problems faced by the farmers in the study area. The results of the study indicate that to reduce the price spread, the onion growers should be encouraged to sell their produce through co-operative marketing societies. Further, greater attention may be given to reduce the marketing cost and margin to intermediaries by taking several measures in Channel-I, II and III because the cost of the produce passed through these channels of marketing. Expansion to onion marketing activities by NAFED and APEDA should be taken up. The marketing intelligence service need to be improved and information made available to the growers and co-operative efficiently. Besides bank credit and financial assistance should be available to the individual farmers for developing production technology and marketing infrastructure. Training of farmers in the areas of production technology, grading, standardisation of produce, quality control and modern methods of marketing will prove to be a viable option.

Problems and Prospects of Mango Cultivation in West Bengal – A Study of Malda District

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The paper makes an attempt to explain the reasons for declining production and productivity of mango in West Bengal with the following objectives: to look into the nature of distribution mango grove with maturity of trees and variety of mango, to assess the production of mango of different varieties, to look into the nature of upkeep and maintenance of mango garden, to look into the nature of leasing out of mango garden for fruits on the eve of mango production, to enquire into the constraints of mango production and to present concluding remarks. Mango cultivation has great potential for crop diversification and raising farm income. But it is unfortunate that mango area in West Bengal has been constant and production of mangoes has decreased as compared to the production of 1960-61. The mango growing districts of the state are Malda and Murshidabad, where mango cultivation has been operative since very long. The average size of mango groves areas for marginal, small, medium and big farmers are 0.51, 1.03, 2.45 and 4.31 hectares respectively. Since mango production involves a lot of production uncertainties due to inconvenient weather, storm, hailstorm, attack of pest and insecticides, the owners of

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mango groves lease out about 70 per cent of their mango groves for fruits at different stages before maturing of final production. Such lease out system not only leads to poor maintenance of mango groves and improper management of post-harvest mango production but also obstructs obtaining the optimum returns from mango cultivation. Nonetheless, per hectare net return from mango cultivation is higher as compared to the returns of the field crops. So, in order to get the optimum return from mango cultivation, it is suggested to undertake improvement in the productivity and quality of mangoes, through replacement of plants from inferior to superior quality of mangos, ensure proper maintenance of mango groves through irrigation, inter-culture, timely application of pesticides and insecticides, harvesting of well-matured fruits and well-arranged packaging of product for distant markets, etc. The owners of mango groves need to be educated and encouraged to ensure proper maintenance of mango groves and to undertake the responsibilities in the marketing of their product instead of leasing out the groves at pre-harvest stages. Post-harvesting infrastructure needs to be developed along with the minimum support price of mango in case of excessive production.

Horticultural Prospect and Potential in India

A.K. Giri*

The paper tries to assess the regional potential of triggering agricultural development through horticultural crops with the help of secondary data as available in the publications of the Centre for Monitoring Indian Economy (CMIE). The analysis of the secondary data uphold the following aspects: in vegetable production, West Bengal and Orissa are the leading states and in case of fruit production, Maharashtra and Andhra Pradesh are ahead of others. Six to twelve per cent of gross cropped area and 8 to 9 per cent of gross cropped area respectively in West Bengal and Orissa are allocated to vegetable cultivation. In Maharashtra and Andhra Pradesh the area allocated to fruit production was 2 to 3 per cent with an increment to 5-6 per cent during 2004-05. Again, land area released from foodgrain is utilised for crops other than fruits and vegetables in Maharashtra and Andhra Pradesh whereas the increased gross cropped area in West Bengal is allotted to foodgrains, vegetable and fruits. Further, value addition in vegetable and fruit-based production business is substantially higher than the same from other field crop based production business in West Bengal agriculture. The leading position enjoyed by the States clearly indicates the interest and active participation on the part of the farming community of the respective states. But many a times in the past, farmers' interest and involvement have been shattered by the absence of cold chains, post-harvest treatment facility and the institutions linking vegetable and fruit growers to different domestic markets

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within the country and to the international markets. So, the necessary and appropriate steps to smoothen the marketing arrangement are *sin-qua-non* for this sector to become a potentially important contributor to gross domestic product of the country.

Impact of Horticulture Development Programmes on Employment Generation in Konkan Region of Maharashtra

S.N. Tilekar, M.N. Waghmare and V.A. Thorat[†]

The impact of horticultural development programmes on employment generation in Konkan region of Maharashtra has been studied based on the secondary data for the years 1981-82 to 2000-01. The annual compound growth rates were computed based on employment generation for two sub-periods, viz., Period I (1981-82 to 1990-91) and Period II (1991-92 – 2000-2001). The annual compound growth rate of employment generation for Konkan region revealed that during the period under study, direct employment generation through horticultural production has grown significantly at the rate of 10.29 per cent per annum. In Period I though the growth in employment generation was positive but not significant. In second period in all the districts of Konkan region, the area under horticultural crops increased significantly, which has resulted in high growth in employment generation through horticultural production. The growth in employment generation across the different districts revealed that Raigad district had registered the highest growth of 18.84 per cent per annum followed by Thane, Ratnagiri and Sindhudurg districts. The compound growth rate for employment generation coincides with the growth rate for production of horticultural crops in different districts indicated that growth in employment generation is the effect of growth in horticultural production in the respective district. The increased horticultural production has generated additional employment in the region. In the year 1990-91 employment generated through horticultural production was 133.26 lakh man-days, which increased to 467.07 lakh man-days during the year 2000-01. The growth in employment generation through horticultural production was 15.40 per cent per annum. Horticultural research and development has resulted in increased horticultural production. The increased horticultural production absorbs additional manpower for maintenance of orchards and generates additional employment.

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Economic Analysis of Cultivation of Aonla in Sandawa Chandrika Block of Pratapgarh District of Uttar Pradesh

S.K. Singh and Mohammed Sayeed*

This study attempts to examine the cost of cultivation of aonla in Sandawa Chandrika block, of Pratapgarh district of Uttar Pradesh. The study is based on 40 aonla cultivators comprising 10 each from four categories of farms, i.e., marginal (<1 ha.), small (1-2 ha.), medium (2-4 ha.) and large (> 4 ha.) selected randomly from five villages as this block accounted for the highest area under aonla crop in the district of Pratapgarh. The study revealed that per hectare cost on an average came to Rs. 28958.64. It was lowest at Rs. 25705.04 on marginal, Rs. 27388.08 on small, Rs.29491.16 on medium and the highest was Rs. 33250.44 on large size group of farms. The major cost involved in the cultivation of aonla was reported on human labour followed by manure and fertiliser, plant protection and irrigation charges. It was noticed that family labour cost was higher on marginal farmers and it decreased with the increase in the size of farms and a reverse trend was observed for hired human labour. On an average cost A, cost B and cost C were observed at Rs.15,989, Rs. 19,562 and Rs.22,937, respectively and all these costs increased with the increase in the size of farm. It shows that large farmers have more investment in relation to small farmers to reap the better returns on investment. It shows that farmers of above 4 ha. are managing their resources properly to raise the level of output. The farmers of the study area faced problems in the production of aonla cultivation like availability of fertiliser, insecticide and pesticides at reasonable price and lack of marketing facilities which need to be improved in the interest of the aonla cultivators.

Enhancing the Farm Income through Vegetable Crops in Solan District of Himachal Pradesh

S.P. Saraswat, Pratap Singh and Amresh Sharma[†]

The paper examines the status, trend and degree of commercialisation of agricultural crops in five villages of Solan district of Himachal Pradesh. For the purpose, the data and information regarding cropping pattern, input use, marketing expenses and production etc., were collected for the agricultural year 2004-05. Himachal Pradesh has witnessed an upsurge in area and production under fruits and vegetable crops during the last three decades. The crops have vast potential for the production in the state because of mild climate and other favourable conditions. The share of area under vegetable crops increased by 271 per cent during four decades in

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Solan district, while in Himachal Pradesh as a whole the increase was 100 per cent during the same period. The holding size for the average category of farm was 1.52 hectare and the same varies from 0.29 ha on sub-marginal farms to 7.71 ha on large farms. The average operational holding varies from 0.19 hectare on sub-marginal farm to 1.66 ha on large farms while the average operational holding was 0.52 ha only. On an average more than 66 per cent area is under commercial crops. The study shows that by shifting from traditional crops to vegetable crops is manifold remunerative. The returns per hectare from tomato were the highest followed by capsicum, cauliflower seed, bean and peas. In the case of food crops and other minor crops the net returns are very much lower as compared with vegetable crops. And the crops grown on large size were more commercialised than crops grown in lower size group of farm. The commercialisation of hill agriculture has brought prosperity to the farming community. This owes much to the state's intensive investments in infrastructure and active promotion of marketing arrangement, producers co-operatives, credit facilities, technological innovation, extension services and storage network. The study suggests some more initiatives like curbing division of land below a certain level and establishment of marketing co-operatives for bringing more prosperity to medium and small farmers.

Extent of Post-Harvest Losses of Ginger in Assam – A Micro Level Analysis

C. Hazarika*

This study was undertaken to estimate the extent of post-harvest losses of ginger at various stages in different operations. For the purpose of study four districts, viz., Kamrup, Barpeta, Karbi Anglong and North Cachar hill districts of Assam having largest area under ginger were selected based on secondary data collected from published sources. Using stratified random sampling technique a total of 200 farmers covering 50 farmers from each district were selected to study the various aspects of post-harvest losses. The total amount of post-harvest losses for ginger was estimated both at farmer's level as well as the middlemen level in the market. The losses at different levels according to various operations were also estimated starting from farmer to the consumer level. It is revealed from the study that for all the categories of farmers out of the total production, 0.09 per cent and 0.07 per cent of the total production were used for home consumption and kind payment respectively, while 4.68 per cent of produce was lost as post-harvest loss. The overall marketed surplus of ginger for the state was observed to be 93 per cent of the total production reflecting the commercial nature of the crop. Home consumption of ginger showed an inverse relationship with the farm size group in the state. The average post-harvest loss of the state was found to be 4.68 per cent of total production at the

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growers level. Post-harvest loss in regard to assembling was observed to be highest for spoilage/wastage due to delayed harvesting. However, losses in the market was observed to be highest for loss due to lack of market demand accounting for 15.75 per cent of total loss followed by weight loss (7.79 per cent), produce rejected by the agents (2.94 per cent), and space problem in the market (1.19 per cent) respectively. The main market middlemen, who transacted the ginger into different markets of Assam and outside the state, were identified as Retailer (R), Wholesaler (WS) and Wholesaler (Local). It is observed that overall post-harvest loss of the middlemen involved in the marketing of ginger was 9.98 per cent of total quantity transacted. The total post-harvest loss of ginger at growers' level was estimated to be 4.68 per cent of the total production. On the other hand, the average post-harvest loss in the middlemen level was found to be 9.98 per cent of the total production commodities transacted by the middlemen. Thus the overall post-harvest loss of ginger in Assam was estimated to be 14.66 per cent of the total of the crop.

Fruits and Vegetables Processing in India: Current Trends, Constraints and Prospects

Brahm Prakash[†], D.K. Sharma[†] and V.P. Tyagi[‡]

An attempt has been made in this paper to study the current status of fruits and vegetables processing in India and its emerging trends, to identify the constraints experienced by fruits and vegetables processing industry and to suggest policy measures for strengthening the network of this industry in India. The study revealed that only 1.8 per cent of total production is commercially processed in India. Area and production of fruits and vegetables increased during 1987-88 and 2004-05 but yields of these crops are quite low in comparison to yields obtained in developed countries. Economic liberalisation facilitated huge investment in several new fruits and vegetables processing units since 1991. Low productivity coupled with inadequate production technology, non-availability of good quality raw material, poor quality of finished products, prices risks involved in production of fruits and vegetables, non-availability of refrigerated transport and cold storages, good quality packing, poor storage of quality seeds, high post-harvest losses, high tax structure, high premium on crop insurance, absence of legal framework for contract farming, high cost of processing and packaging, costly power and frequent power breakdown are the major constraints being faced by fruits and vegetables processing industry. The prospects of this industry is bright due to changing food habits and practices, reduced dependence on domestic servants/cooks, increasing health consciousness, status promotion and changing socio-economic scenario. The study concludes that increasing productivity of fruits and vegetables: through R & D efforts, availability of

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refrigerated trucks, construction of cold storage, proper packaging, grading, brand status, liberalising the laws and reducing tax structures, reducing post-harvest losses, promoting contract and corporate farming will also be helpful in establishing more processing units.

Triggering Agricultural Development through Horticulture Crops in Maharashtra

S.S. Kalamkar*

An attempt is made to examine the growth in horticulture sector of Maharashtra state over the last four decades. The study is based on secondary data obtained from various published sources. The share of primary sector in the state economy has got marginalized over the years. As future growth of agriculture in the state is heavily dependent on the performance of horticultural sector because of its natural advantages, it is essential to examine the growth rate of area under certain horticultural crops. The state has potential opportunity to develop horticulture sector compared to the agricultural practices in the state. Maharashtra has the highest area and production in the country devoted to fruits and third largest area under vegetables. Since 1990-91, horticulture development is linked with the Employment Guarantee Scheme which has helped to boost the area under different fruits over one million hectares. During the last ten years, there has been significant increase in the area and production of horticultural crops in the state. Maharashtra has potential and plenty of scope to grow various horticulture crops. Different types of soil, diverse agro climatic conditions, adequate technical manpower, well developed communication facilities, increasing trend in drip irrigation, green house, use of cold chain facilities and vibrant farmer organisations offer wide opportunities to grow different horticultural crops in the state.

Policy Implications for Development of Horticulture in Madhya Pradesh

S.K. Gupta[†]

The paper examines the policy implications for development of horticulture in Madhya Pradesh. The State has immense potential for horticultural development. The horticulture crops occupied an area of nearly 3.5 per cent of the gross cropped area of the state. The study is based on available data and information during the study period with a view to identify important constraints and review the efforts made by the State Government in the past to meet major challenges, and, to present the

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views of different stakeholders in the form of meaningful policy requirement matrix. A total of 48 stakeholders were contacted out of which only 12 stakeholders responded. The methodology involves a thematic review of the existing material at state level and interviews with the stakeholders on crucial issues. The growth in area between 1982-83 and 1999-2000 was observed to be the highest in spices followed by vegetables and fruits. The production of these horticultural crops also increased during these two periods. The State accounts for only 2.79 per cent of the total area and 5.09 per cent of the total production under fruits in the country, while in the case of vegetables, the area share was 18.08 per cent and production share was 15.68 per cent during 2004-05. Generally, the production of horticultural crops is thinly spread throughout the state but some pockets of concentration do exist and offer potential for further development. The following horticultural crops hold potential in particular districts: fruits like banana (Khargone, Khandwa), citrus (Chhindwara), guava (Gird, Bundelkhnad region), and vegetables including coriander (Guna, Mandsaur), potato and garlic (Indore) offer great potential for further development. The following measures are suggested for achieving two-fold increase in the production of fruits and vegetables: nursery act to be enacted to facilitate availability of quality planting material, arrangements should be made for sufficient production of disease free and high quality planting material. Appropriate technology, suitable for different agro-climatic zones, needs to be developed and farmers be encouraged to adopt them. Cultivation of malwa potato, which has immense potential for value addition and export could be promoted and its area and productivity could be increased. Effective marketing of horticulture products should be ensured. Liberal financial assistance must be provided to the farmers for planting fruit bearing plants in the non-forest wastelands for 3 to 5 years till the fruit bearing stage and adopt drip method of irrigation. State government needs to promote creation of facilities of cold storage, cold chains etc. Export of horticulture produce needs to be encouraged and farmers should be encouraged to cultivate spices, medicinal and aromatic plants.

Profitability and Problems of Isabgol (*Plantago Ovata* Forsk) Cultivation in Madhya Pradesh

H.O. Sharma, N. Khan and P.K. Mishra*

In Madhya Pradesh Isabgol was grown on area of 4372 ha and Mandsour, Neemuch, Jabalpur and Ratlam are found to be the major Isabgol growing districts of the State. Isabgol is a main medicinal crop of Madhya Pradesh. The study analyses the relative economic impact of cultivation of Isabgol with its competitive crop and its improved package of practices suggested by the horticulturists, to identify the bottlenecks in its marketing and suggest possible remedies. Mandsour district was

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purposively selected for the study having maximum area under the crop. The villages having maximum acreage under the cultivation of the selected crops were further selected for the study. A snow ball technique was used for selection of respondents in the area under study and 50 respondents were selected from five villages, viz., Balaguda, Badari, Turkiya, Narayangarh, and Pipliavisnia. The primary data were collected from the sample respondents with the help of pre-tested interview schedules by personal contact relating to the year 2003-2004 and the secondary data related to the years 1995-96 to 2002-03. The cultivation of Isabgol has been found to be a profitable combination of the crop rotation prevailed in the area under study. An average cultivator of the area received Rs. 26,400 per hectare from the cultivation of Isabgol. On investment of Rs. 1.00 an average grower received Rs. 2.56 over the variable cost and Rs. 1.79 over the total cost for cultivation of Isabgol, while he received only Rs. 1.82 at variable cost and Rs. 1.47 over total cost from cultivation of wheat in the area under study. All the growers reportedly faced only one problem in the cultivation of Isabgol in the area under study that of unfavourable weather conditions at the time of maturity of crop. The other problems, ranked first and reported by the more than 50 per cent respondents includes lack of technical know how, non-availability of desired inputs, problem of electricity at the time of peak operation period and lack of skilled labour. The majority of other respondents also ranked these problems at second rank while the majority of respondents reported the risk at the time of harvesting. For increasing area of Isabgol in the state efforts should be taken up for strengthen the extension wings of the State government. Besides efforts should also be made to strengthen the local-specific scientific research for the medicinal and aromatic crops in the various agro-climatic regions of the State. There is need to set up processing units for the products of the medicinal and aromatic crops in the area under study, as it holds great potential. This will also help in increasing the bargaining power of the farmers and promote general development of the region. The State should encourage/provide infrastructural and institutional facilities to corporate, co-operatives and the private small players. The agro-processing unit helped not only to raise the farmer's incomes but also those of the landless labourers as well as have helped in stimulating the general development of the region. The State government should come forward to ensure the benefits of the cultivators growing medicinal and aromatic plants through contractual arrangements between the farmers and the company, by declaring of minimum support price for these crops or by giving the premium prices, in the situation when the supply of the produce is more.

Agriculture Development through Horticulture Crops in Upland Areas: An Empirical Analysis

Babilata Shroff[†]

The objective of the paper is to study the problems and prospects of the production of horticulture crops in the upland area in Titilagarh agriculture district in KBK districts of Orissa. Five villages of this area are selected randomly and the area under different crops and impact of diversification towards the production of horticulture crops on the income and standard of living of different categories of farmers are studied. The results of the study indicated that almost all the people in the villages were dependent on agriculture for their livelihood but were risk averse in adopting a new crop or technique. Horticulture crops have raised the level of income and standard of living of the small and marginal farmers. Adoption of appropriate location-specific crop pattern with lab-land link will eradicate poverty, check migration, arrest stagnation and improve the rural economy. Establishment of processing units would encourage area under horticulture crops, increase employment and check migration. The study concludes that transformation from subsistence to commercial and horticulture in the upland area offers the best solution to face the post-reform challenges along with sustainable agricultural development and provision of livelihood security to the masses.

Economics of Guava Production in Kanpur Nagar District of Uttar Pradesh

J. Rai and Rahul Kumar Rai*

The study was carried out in Kanpur Nagar district of Uttar Pradesh to evaluate the economics of guava production. The district Kanpur Nagar was selected purposely because maximum guava orchards and growers is concentrated in this district. A two-stage random sampling technique was adopted to select the villages and guava growers. Four villages Shivdeenpurva, Baniyapurva, Gopalpurva and Katari were selected randomly and 24 respondents were selected randomly from the list of all guava growers from selected villages, in proportion to the respondents among each village under different size groups. Data were collected from selected respondents on well prepared schedules and analysed using the costs and return analysis. On an average input cost of Rs. 31673.50 per hectare was incurred during establishment period on guava orchard at first to three years basis. The study observed that the guava orchard is economical up to 3-12 years age thereafter the size and quality both declined. Intercropping of wheat play an important role to provide income in gestation period for curtailing the establishment cost. Lack of innovative

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market access, lack of processing industries, cold storages and inefficient transportation are the major drawbacks which hamper the productivity and returns to guava growers. It is suggested to set up guava growers co-operatives under Government support system to seek remunerative prices through efficient marketing system by establishing processing units and storage facilities, transporting the fruits to other markets specially during post-harvest period for harnessing better income and employment through guava fruit cultivation in the study area.

Comparative Economic Analysis of Post-Harvest Losses in Vegetables and Foodgrain Crops in Chhattisgarh

A.K. Gauraha and B.S. Thakur[†]

The study aims to estimate the post-harvest losses in vegetable and food grains crops. For the purpose of study 45 vegetable growers from two villages of Mungeli tehsil of Bilaspur district of Chhattisgarh were selected purposively and the data pertained to the year 2005-06. The samples were divided into three categories, viz., small, medium and large farms. To estimate the post-harvest losses of vegetables and foodgrains at farm, market and consumer level appropriate number of market functionaries and consumers were selected. The estimation of post-harvest losses was done on the average basis. The study concluded that the average cultivated area was 3.87 ha and cropping intensity was 238.76 per cent. The cost-benefit ratio was maximum for chilli followed by potato in vegetable crops. In case of foodgrain crops it was maximum in paddy followed by gram. Wholesaler-cum-commission agents and Primary Agricultural Co-operative Society (PACSs) were the key individuals in procuring vegetables and foodgrains from the farmers respectively. Overall the post-harvest loss for vegetables and foodgrain crops towards the consumption and of the post-harvest distribution system was around 17.08 per cent and 8.60 per cent of the total quantity traded respectively. The resultant losses were the current practices used in post-harvest handling and the standards of material facilities used for storage. Packing and transport are outdated and contributed directly to post-harvest losses. There is urgent need to bring down the post-harvest losses prevailing at various stages of marketing through promotion and adoption of cost effective post-harvest technological services such as, field level grading, cleaning, packaging in perforated plastic bags on corrugated fibre bases, precooking, efficient transportation and in handling and re-handling of crops. Besides there is a strong need to promote direct and group marketing of vegetables to enhance the producer's share in consumer's rupee and to ensure the supply of fresh quality of vegetables to the consumer at reasonable price.

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Assessment of Post-Harvest Losses and Marketing Risks of Potato Crop in Comparison to Wheat Crop in Allahabad District

D.K. Singh and Hasib Ahmad*

Allahabad is one of the most agriculturally advanced districts of Uttar Pradesh. Among the crops, wheat and potato are dominant crops which accounted for 36.06 per cent and 2.55 per cent to gross cropped area respectively during 2006-07. The average producing per hectare was 17.82 qtls and 172.93 qtls for wheat and potato respectively during the corresponding period. This district is still not self sufficient in food grains to meet the consumption need of the existing population. This district is divided into two distinct parts namely, Gangetic Plains Region and Vindya Zone. First, one region is agriculturally very advanced than others. Therefore, thirty-six farmers from two villages of a block of Gangetic Plains of the district were selected to assess the post harvest losses and marketing risk of potato crop in comparison to wheat crop. The reference year pertained to 2006-07. The analysis reveals that overall 8.04 per cent and 10.45 per cent post harvest losses occurred in wheat and potato respectively. Thus, loss was higher in potato than in wheat on the sample farmers. The analysis also reveals that occurrence of post-harvest losses was found maximum at storage stage in both crops. Due to non-availability of space in cold storages, the post-harvest losses was higher in potato than wheat. The sample farmers had kept maximum quantity of production of wheat in their houses, so the attack by pests, insects, rats, etc. were responsible for huge wastage in stored grains. Potato could not be retained in houses in summer season. Of the total production of potato only 50 per cent was stored in cold storages and 25 per cent was sold just after harvesting. The rest 25 per cent was stored in the houses.

In the case of wheat, almost all the production was kept in steel bin or mud made containers. The maximum losses was occurred in grains of wheat which had been stored in mud made containers. However, the quantum of loss in both crops increases with increase in size of farms. While loss at storage stage was found higher on marginal farmers than small and medium farms because of non-availability of proper storage facilities, followed by threshing, grading, packing, etc. for both crops. It may be concluded that the post-harvest losses was higher in potato than wheat across the size of farms.

The study suggests that State Government should make an effort to declare the procurement price of potato before its sowing to avoid the distress sale. At present, the capacity of cold storage in Allahabad district is only 4 lakh MT against the production of 8 lakh MT, remaining 50 per cent production was sold at throw away price. Hence, the construction of cold storages should be given top priority in potato growing belts. Apart from this, the establishment of processing units are needed for

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preparation of chips, papad, flour etc from potato. In case of wheat, the farmers should be advised to store the grains in steel bin with scientific manner to avoid the attack by pests, insects, rats etc. There were great fluctuations in the price of potato because of improper arrangement of storage of potato. On account of this, there was maximum risk in potato. With a view to minimise the market risk, the inefficient marketing system should be modified into efficient marketing system to develop the infrastructural facilities.

An Economic Appraisal of Post-Harvest Losses in Vegetables in Uttar Pradesh

R.B. Singh, R.K. Kushwaha and Sunil Kumar Verma[†]

The study attempts to assess the extent and magnitude of post-harvest losses in vegetables at various stages of handling and identify the factors responsible for such losses. The vegetable crops because of their moisture content are inherently more liable for deterioration in quality and quantity especially under tropical conditions. The study is confined to two major vegetables namely, onion and potato grown in Uttar Pradesh. Primary data were collected from the sample potato and onion cultivators and various market intermediaries through personal interview with the help of pre-tested and structured schedules and the study pertained to the agricultural year 2006-07. The post-harvest losses occurred due to faulty methods of harvesting, threshing, cleaning, drying, storage, transportation, processing, packaging and distribution of agricultural commodities. Transit loss was another important component of post-harvest loss contributing about 24 per cent of the total loss. The functional analysis revealed that inadequate storage and inadequate transportation activities coupled with bad weather conditions positively and significantly influenced the post-harvest losses at the farm level.

Horticultural Development: A Key to Diversification in Uttar Pradesh

R.K. Singh and N.P. Singh*

The paper highlights the diversification/production potential of horticultural crops in Uttar Pradesh and also draws a roadmap for its development in Uttar Pradesh state. The study is based on data available on various aspects of horticultural achievements obtained from various published sources in Uttar Pradesh. Out of 100 fruit and nut species of tropical origin that may be considered for commercial

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development a small number actually succeed commercially. This calls for developing specific criteria for determining the commercial success on agro-climatic zones of the state. For achieving commercial success in the context of diversification the most important aspect is the selection of fruits of commercial value under planning process. In present age, the potential of fruits for diversification means adoption of process for knowing commercial value through generation of a potential list of food species, determine commercial (economic) species, determine commercial success of foods in given region, defining development opportunity and potential problems/constraints of fruits most likely to be commercially successful in a particular area and earmark key extension point required to ensure commercial success.

Possibilities of Increasing Income and Employment through Optimum Allocation of Resources in Vegetables

Rakesh Singh[†], Shailesh Kr. Singh[‡] and H.P. Singh[†]

The present study was undertaken in Deoria and Varanasi districts of Eastern Uttar Pradesh with a view to examine the existing cropping pattern, input use and profitability of various vegetable crops, to find out the optimum allocation of resources, to work out the impact of optimum allocation on income and employment and to suggest suitable measures for promoting vegetable farming. The data were collected from 200 farmers, 50 farmers each from two villages of Bhatpur Rani block of Deoria district and 50 farmers each from two villages of Arjaline block of Varanasi district. Linear programming was used to find out the optimum allocation of resources. It was observed that multiple cropping is currently being followed in the study area. This helps in minimising the risk arising out of failure of some crop as well as fluctuations in the price of produce. However, the optimum plans obtained under the situation of with and without cash borrowing and also under existing as well as improved technological conditions showed the ample scope of production of high value vegetables. In the optimum plans derived under existing technology as well as improved technology without cash borrowing situation, the net income was increased by about 14 per cent and 17 per cent respectively over the existing plan. This increase in net income was to the magnitude of 36.21 per cent and 59.75 per cent over the existing condition when incorporating cash borrowing activity with existing technology and intermediate technology respectively derived under optimum plan. However, this trend was not observed with human as well as bullock labour employment. Human labour employment decreased by about 5.81 per cent when optimum plan was derived under existing technology without cash borrowing. Similarly, there was no significant variation in bullock labour employment also. By

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incorporating cash borrowing activity, the optimum plan under existing technology and intermediate showed that human labour employment increased by about 11 per cent and 35 per cent over the existing condition respectively. The study suggested that the various optimum plans as obtained under different resource constraints can be made acceptable by the farmers if minimum price of the produce is assured through appropriate marketing arrangements of the produce. If specialised vegetables production is to be encouraged in the areas, crop insurance for such high value crop should be introduced in order to minimise the risk arising on account of failure of crop or price fluctuations.

An Economic Analysis of Production and Marketing of Sweet Potato Crop in Bastar District of Chhattisgarh

K.N.S. Banafar and Suklu Ram Salam*

The study aims to examine the cost and returns of sweet potato, price spread and constraints in production and marketing of sweet potato. Sixty four farmers were selected randomly from three villages of Bakawand block of Bastar district of Chhattisgarh. Primary data were collected for the year 2004-05. The study revealed that the average size of holding of the sample households was 3.58 hectares. Paddy, wheat, okra and tuber crops were the major crops grown in the study area. The cost of production per quintal of sweet potato crop depicted a declining trend with increase in the farm size. On an average per hectare yield of sweet potato was 94.94 quintals. The average cost of production per quintal was worked out to Rs. 170.11. Productivity of sweet potato and input-output ratio increases with increase in farm size. There were two marketing channels for the marketing of sweet potato – Channel-I: Producer – consumer; Channel-II: Producer – village merchant – wholesalers – retailers – consumer. The most efficient marketing channel for tuber crops was found to be channel-I followed by channel-II. The producer share in consumer rupee were higher in channel-I. The major constraints in the production of sweet potato were lack of irrigation water in seasonal crops followed by lack of technical knowledge and lack of resources. The constraints in marketing of tuber crops were the lack of storage facilities followed by lack of regulated market and co-operative society. Considering the profitability of tuber crops in the study area the farmers may be encouraged to grow tuber crops in large area. For increasing the productivity of tuber crops better seed/planting material of high-yielding varieties must be provided to the farmers at subsidised rates with assured irrigation facilities. Farmers as well as extension workers should be encouraged to adopt new cultivation harvesting and processing technology. The financial support should be extended by the government for taking up programme for increasing production and productivity

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of tuber crops. Marketing of tuber crops in the study area is not properly organised and so the farmers' share in the price paid by the ultimate consumer is very small. Lack of proper storage facilities and lack of organised market for tuber crops forces farmers as well as other intermediaries to sell off the produce immediately at lower prices. There is an urgent need to develop proper storage and marketing facilities in the study area in order to get higher returns of the produce. Most of the tuber crops have value added products like energy drinks, jam, pickles, sauce etc. These type of value added products might also be manufactured in the state through small scale industries which will encourage farmers to cultivate tuber crops in large areas and this will boost up the economy of the farmers as well as state.

Fruit and Vegetable Processing in India and Its Role in Agricultural Development

B.C. Roy[†]

The paper aims to analyse the growth and performance of fruit and vegetable processing in India; to identify the constraints/drivers to the development of fruit and vegetable processing in India, and to examine the prospects of fruit and vegetable processing industry in the country as a tool for agricultural development. The findings of the study reveals that the growth potential of India's fruit and vegetable processing industry is enormous. The industry has a very high multiplier effect which is greater than that of power or telecom sectors. Besides the revenue generation potential, fruit and vegetable processing has the largest employment generation potential too. The employment generation in the production of fruits and vegetables are 50-150 per cent higher, as compared to that of cereal cultivation. It is also found that in spite of the significant growth in production of fruits and vegetables, the proportion of production processed commercially has not increased commensurately. There is a need to modernise the existing processing units and develop infrastructure particular in regions (eastern and north-eastern region) with high production potential which hitherto received little attention. There is also a need to encourage contract farming in order to overcome the problem of raw material supply faced by the industry.

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Performance Appraisal and Factors Affecting Growth of Horticultural Sector in the North East Region of India

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An attempt is made to analyse the performance of horticulture sector across the north eastern states, pattern of plan investment as well as output growth of horticultural sector/commodities, analyse the various factors influencing development in horticultural sector in the region and price analysis of important horticultural commodities in major markets relevant to the region. The study is based on primary and secondary sources of data. Primary data were collected from 160 farm households of all seven districts of Meghalaya state pertaining to the year 2007-08. The investment in horticulture sector in the north-eastern states has started paying dividends but at a slower rate in comparison with its underlying potential. Development of fruit sector has been observed to be encouraging but same is not true for the growth in vegetable production. Mass production and distribution of quality planting material for fruits and spices can be given top priority. Special support and focus needs to be given to capacity building of the farmers to produce vegetables under protected as well as open condition. Expansion of area under off-season vegetable crops should be made around the various hilly tracts of the region. Application of nutrient and water management may be given special focus to improve the productivity of horticultural crops particularly vegetables. Farmers growers association, contract farming (particularly for organic production) and production through Self Help Groups (SHGs) may be promoted to increase the volume of production, which in turn would facilitate the marketing of these high value crops. One of the major problems in growth of horticultural sector in the region is the lack of sustainability of any project – once the government intervention is withdrawn, the farmers either withdraw or fail to continue their activities primarily due to their resource poor condition. Providing loan at a special rate of interest can be attempted to address this issue. Appropriate methodologies are needed to estimate data regarding the area, production and productivity of horticultural crops and simultaneously, creation of detailed database is strongly advocated. Finally, establishment of market intelligence unit is utmost important to provide advisory services of price movement and market arrival of various horticultural commodities.

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Demand for Horticultural Products and Its Implication on Indian Agriculture

Sushila Kaul[†]

The study examines the consumption pattern of fruits and vegetables in different states in rural and urban areas, and its implications on Indian agriculture. The present study revealed a rising trend in consumer expenditure on fruits and vegetables in rural as well as urban areas of the country. This might be due to rising prices and higher levels of consumer incomes. Development of horticulture would help the nation and will lead to prosperity of producers and higher standard of living in rural areas.

Marketing Behaviour of Marigold Flower Cultivation in Jaipur District of Rajasthan

Ripu Daman Singh, S.S. Burark and Girdhari Lal Meena*

The present study investigates the marketing behaviour of marigold growers in Jaipur district of Rajasthan. Jaipur district was selected on the basis of highest area and production under marigold flower in Rajasthan. One tehsil, viz., Jamwa Ramgarh, out of 13 tehsils, was selected purposively on the basis of highest area and production of marigold flowers. Four villages, namely Jamwa Ramgarh, Medhraj Singhpura, Rampura and Nayabas were purposively selected from Jamwa Ramgarh tehsil. In all 60 farmers were selected and data were collected for the crop year 2005-06. Marketing efficiency was worked out by using different methods. Two marketing channels were identified for marketing of marigold flowers. Out of them channel-I (Producer-Commission agent-Retailer-Consumer) emerged as the important channel from producers point of view where the producers received more percentage share in consumer's rupee than the channel-II. The total marketing cost was Rs.6.90 and Rs.8.63 per kilogram of marigold flower for channel-I and channel-II, respectively. The major items of marketing cost were the value of quantity loss and labour charges. On the other hand, retailers earned a margin of 43.77 and 34.69 per cent in consumer's rupee in channel-I and channel-II, respectively. This shows that retailers margin was higher in comparison to producer's share due to creation of form utility by the retailers. The channel I was more efficient than channel II as there was only one intermediary, i.e., retailer in channel I. Inadequate transport, processing and storage infrastructure and services in rural areas push up marketing costs and reducing the marketing efficiency. Alternative marketing systems that could reduce

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transport costs, capture economies of scale and increase in quantity of the produce is needed to improve the marketing efficiency. The study provides suggestions to policy makers, so that marketing efficiency of marigold can be enhanced in the study area. Regulation of flower markets, establishment of marigold producers' co-operatives, establishment of processing units and opening of new purchasing centre in producing area could increase the marketing efficiency of marigold flower in the study area.

Marketing Efficiency of Green Chilli in Udaipur District of Rajasthan

S.C. Persoya, Hari Singh and C.P. Singh[†]

A study was conducted in Udaipur district of Rajasthan to identify the various marketing channels involved in the marketing of green chilli and to estimate the marketing efficiency of different marketing channels. Among all the ten tehsils of the Udaipur district, Girwa tehsil was randomly selected. The Krishi Upaj Mandi Samiti (fruits and vegetables), Udaipur (within the tehsil), where the green chilli producer sell most of their produce, was purposively selected. Two villages closer to market and two villages away from the market were randomly selected from this tehsil. From each selected village 15 green chilli growers making a total sample of 60 farmers were selected randomly in proportion to the size of holding. Four channels were identified in the marketing of green chilli. Among these four channels, channel-I (producer-commission agent-wholesaler-retailer-consumer) was the important channel through which 80 per cent of the total green chilli quantity moved. The total marketing cost was maximum in channel – I and minimum in channel-IV (producer – consumer). The marketing margins were maximum in channel-III (producer – retailer – consumer), i.e., Rs. 254.32 per quintal. The highest marketing margin was earned by retailer. The producer's share in consumer's rupee was highest in channel-IV and lowest in channel-I. A comparison of marketing efficiency in different marketing channels revealed that though channel-III was more efficient but the quantity moving through this channel was only 1.25 per cent. Therefore, channel-II and channel I which were next more efficient can be chosen by producer-sellers through which about 19 and 80 per cent chilli was moved, respectively.

Diversification of Cropping Pattern through Horticulture Crops in Rajasthan

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The present study has been undertaken to determine the place of horticulture crops in the cropping pattern, the changes taking place in the cropping pattern over

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time and the temporal growth in area and production of horticultural crops in Rajasthan. Time series data were collected for the period 1990-91 to 2004-05 from the published sources. The area under fruits, vegetables and spices have positive growth. The growth in area under fruit crops was negative between 1990 and 1995 and has gained momentum after 2000-01. The area under vegetable crops has constantly increased. The area under spices has increased during the period 1990-1995, but lost ground either in favour of fruits and vegetables or oilseed crops later. The foodgrains crops has experienced a decline in area by 571.6 thousand hectares in the last one and a half decade in favour of oilseeds, fruits and vegetables. The area under orange, guava, ber and aonla has increased over time. The area under orange has shown a positive change throughout. Mango is another important fruit of Rajasthan occupying a major portion of total area under fruits but its area has declined over the years. The area under kinnow, an important export crop of northern districts, has shown a decline in 2004-05 compared to 1990-91. Among the vegetable crops onion occupied the maximum area. The landscape of vegetable crops in Rajasthan is bright and their area has shown an increasing trend in the last 15 years. Coriander and cumin are the major spice crops of Rajasthan together occupying 74 per cent of the total area under spices. The area under coriander, cumin, garlic, fennel and methi has increased while it has declined in case of chilli, ginger and turmeric. Productivity improvement through technological interventions have played a major role in increasing the production of fruits while policies of governments played a comparatively larger role in the enhancement of production of vegetables. Thus selection and identification of improved varieties of vegetables with higher yields and assuring their acceptance by the farmers through proper extension activities is very important. In the case of spices the rise in production has almost equally contributed by both these factors i.e., government policies and improved technology.

A Study on Marketing and Marketing Efficiency of Potato in Ghazipur District of Uttar Pradesh

Manish Kumar Singh, N.P. Singh and Ajeet Vikram[†]

An attempt has been to study the system, method of sale and channel commonly used in marketing of potato in Ghazipur district, Uttar Pradesh. The study pertained to the year 2007. The different marketing channels identified in marketing of potato are: Channel I: Producer – Consumer; Channel II: Producer – Retailer - Consumer; Channel III: Producer – Wholesaler – Retailer- Consumer and Channel IV: Producer – Village merchant - Wholesaler – Retailer – Consumer. In the case of marketing of potato the producer received low share of consumer's price in channel III than

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channel II. Moreover in channel IV, producer's share in consumer's price was marked lowest as compared to channel II and channel III. The marketing margins received by the wholesaler and retailer were lower as compared to channel III. Marketing efficiency indices for marketing channels II, III and IV were 5.75, 4.39 and 3.96 respectively. The index of marketing efficiency was higher in channel II than the channel III and channel IV, indicating respectively higher marketing efficiency in this channel. In this sphere one transaction taking place by producer is that he directly sold his produce to the consumer in village itself (channel I), and in this way the producer does not meet the marketing cost and hence avoids the need to calculate the marketing efficiency.

Production of Fruits and Vegetables in Mahanadi River Bed Area of Chhattisgarh: An Economic Assessment

S.P. Gupta and P.K. Verma*

An attempt has been made in this study to work out the economics of production of summer season fruits and vegetables and constraints thereon. The present study is based on 38 respondents selected from five villages in Mahanadi river bed area of Fingeshwar block in Raipur district of Chhattisgarh state. The study is confined to five major fruits and vegetables, namely, watermelon, muskmelon, pumpkin, cowpea and cucumber. Data collected pertained to the crop year 2005-2006. The study revealed that the per farm cultivated area varied from 3.42 hectare on small farms, 5.65 hectare on medium farms to 10.58 hectare on large farms. The total irrigation is observed to be 29.03 per cent of which 65 per cent area comes under canal irrigation. The total cropped area is estimated as 3.60 ha, 6.20 ha. and 11.19 ha. for small, medium and large farms respectively. The highest cropped area is found to be in summer season mainly due to more crops grown in riverbed area. The cropping intensity is estimated as 105.26 per cent, 108.01 per cent and 103.22 per cent for small, medium and large farms respectively. The transportation cost incurred by the large farmers is worked out as quite high as they covered long distance to dispose off their produce in the market. Per quintal commission paid by medium and large farmers is also observed to be quite high due to maximum quantity sold through commission agents. The commission charged varies from 6-8 per cent in the market. The highest variation in the productivity is observed in the case of watermelon where it varied from 711 quintal/ha. on large farms to 800 quintal/ha. for small farms but such variation is not observed in the case of other crops. Per hectare highest net returns was from muskmelon followed by watermelon, cucumber, pumpkin and cowpea in the case of small and medium farms while the sequence of crops from the profitability point of view is muskmelon, watermelon, pumpkin, cowpea and

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cucumber for large farms. Non-availability of the recommended package and practices and thereby unbalanced use of manures and fertilisers is experienced by most of the producers. Lack of storage facilities, regulated markets, knowledge about export of the produce and market news are some other marketing problems faced by fruit and vegetable producers. Large farmers should reduce the operational cost of fruits and vegetables by using the recommended doses of manure and fertiliser. Soil testing facilities at block level may also be useful in this regard. These crops are highly capital intensive and therefore availability of adequate and timely credit should be made available to these farmers. The marketing cost should also be considered by the financial institutions at the time of financing. Small farmers are advised to pool their small and scattered lots of fruits and vegetables for the purpose of transportation to the market in order to reduce the transportation cost substantially. Producers are advised to grade the fruits and vegetables at their own level to ensure good price for the produce in the market. Creation of storage facilities in market areas may also prove useful in order to avoid the exploitation of the farmers.

An Appraisal of Growth and Prospects of Fruits and Vegetables Processing Industry in India

Archana Shukla[†]

An attempt has been made to analyse the problems and prospects of fruits and vegetable processing industry in India. The country is the second largest production of fruits and vegetables in the world. However only 1.78 per cent of the total production is commercially processed which is below the level in comparison to many developed and developing countries such as Malaysia, Philippines, Brazil and U.S.A. The low level of processing in India are mainly due to inadequate post-harvest technology, lack of transport and marketing facilities, absence of linkages between processing industry and the growers as a result every year lose about 30 to 35 per cent of the total produce which goes waste resulting into huge monetary losses to the farm economy. This clearly shows that fruits and vegetables processing industry in the country is in a state of under development and there exist ample opportunities for investment in this potential productive sector. However in the post-liberalisation era the fruit and vegetable growers have responded positively to the policy changes and the area and production have increased substantially. The growth in production has been mainly due to area expansion. In spite of significant growth in production the proportion of production processed commercially has not increased commensurately. Both the internal and external demand for processed products is on the rise and is expected to grow at a much faster rate in the years to come. There are numerous problems relating to technology infrastructure and policy that constrain the

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growth of fruits and vegetable processing industry. The untapped potential can be realised by adopting modern production and processing technology which should be supported by congenial climate for production, processing and export through public policy support and infrastructural development. There is an urgent need to modernise the existing processing unit and developing basic infrastructure particularly in the eastern and north-eastern region which hitherto has received little attention. There is also a need to encourage contract farming in order to overcome the problem of raw material supply faced by the industry. Finally, the policy makers can formulate appropriate incentives to the corporate sector and assure a policy environment conducive to the establishment of fruit and vegetable processing industry in potential productive areas.

An Emerging Scenario of Higher Employment and Income Potential of Horticultural Crops in Central Region of Uttar Pradesh

R.R. Kushwaha*

An attempt has been made to compare the employment potential and profitability of selected horticultural crops with a few traditional field crops and bring out the possibility of development of horticultural crops in the future. The study has been conducted in central region of Uttar Pradesh. The study is primarily based on the maximum area under the selected crops such as mango and field crops, vegetables and flowers. Higher labour employment of over 310 man-days for jasmine over crossandra was mainly responsible for the relatively increased yield of around 2.5 to 3.5 tonnes. Lower yields and higher production costs due to intensive and continuous cultivation were mainly responsible for lower benefit-cost ratios. A wide range of agro-climatic conditions has been highly favourable to the production of horticultural crops in India. Development during this decade in terms of quantum jump in yields of tomato, chillies, banana, etc. and institutional thrust in exploiting the export potential clearly reveal the great future for the growth of horticultural crops. The prospects for development of horticultural crops such as fresh fruits, mushrooms, floriculture etc. are very bright since the state has several innate agro-climatic advantages. The study also stresses the need for introduction of comprehensive cost of cultivation studies for the horticultural crops so that a rational horticultural price policy could be implemented in the central region of Uttar Pradesh.

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Spatio-Temporal Variations in the Performance of Selected Vegetable and Fruit Crops in India

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The paper attempts to examine the temporal performance of important vegetable and fruit crops in terms of area, yield and production and additional benefits in terms of gross output, income and employment. Growth rates and trend values were estimated for important vegetable and fruit crops as well as cereal crops for the three time periods, viz., period I - 1980-1990, Period II - 1990-2000 and Period III – 1980-2006. Regional variations in production of important horticultural crops were worked out by per cent change in production in 2006-07 over 2001-02. Due to the limitation in the availability of data the temporal variations in regional growth rates as well as trend values could not be worked out. The study is based on the secondary data collected from different published sources, viz., *FAO Production Year Book*, *Economic Survey of India*, *Fertiliser Statistics* and National Horticulture Board, Gurgaon. The findings of the study indicate that the horticultural crops studied have maintained steady growth in terms of acreage, yield and production during each of the three time periods. It is interesting to note that growth rates in yield outpaced the acreage growth. Thus the major increase in production was on account of increase in yield. On the other hand, cereals have witnessed negative growth in acreage. These crops could maintain a positive growth in production on account of some improvement in yield. All the vegetable and fruit crops in general maintained rising trends in their area, yield and production over years. The other highlights of the study are that in addition to the higher nutritional value, vegetable and fruit crops yield higher income and employment per unit of area. The higher biomass production per unit of area has an added advantage in producing organic products.

Diversification towards Horticulture Crops in Haryana: What has been Achieved?

Smita Sirohi and Rajni Jain*

The paper analyses the achievement of Haryana in promoting horticulture crops by analysing the trends in diversification, production and productivity growth, yield gap and technology adoption. The state has witnessed positive but not very substantial diversification towards horticulture crops as the cropped area under

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horticulture crops increased from 1.55 per cent in 1990-91 to about 4 per cent at present. Data across farm-size categories for the year 2002-03 shows higher diversification towards these crops on marginal holdings. Vegetable cultivation accounted for 11.4 per cent of the net sown area in *kharif* and about 2 per cent in the *rabi* season on the marginal holdings as against the overall state average of 1.24 per cent of the net sown area. Among horticulture crops, the vegetable crops predominate accounting for 84 per cent of the 247 thousand hectares in 2004-05 of horticulture area, followed by 10 per cent under fruit plants. The expansion of fruit and vegetable production in the state during the past one and a half decades has come about almost entirely from area expansion as the yield has stagnated at 8-9 tonnes/ha for fruits and 14 tonnes/ha for vegetables. There is large yield gap between the top productivity states and yield attained in Haryana. The extent of adoption of modern package of practices such as, mechanisation, use of improved seeds, fertilisers, pesticides and weedicides is quite high in case of vegetable crops. Low yields despite the adoption of modern cultivation practices in growing vegetables, calls for providing training to the farmers for optimum use of resources and efficient management of cultivation practices. Particularly, there is an immediate need to promote integrated nutrient management and integrated pest management practices with the objective of reducing the expenses of plant protection operation, toxic load in soil and water besides ensuring food safety through toxic free horticultural produce.

Potential and Prospects of Mentha Cultivation in Socio-Economic Development of Small Landholders in Indo-Gangetic Plains of India

A.K. Sharma, M.R. Verma, Rakesh K. Singh and R.K. Singh[†]

The paper analyses the factors responsible for the high extent and growth of mentha cultivation in Uttar Pradesh, the reasons for the popularity of the crop amongst two types of small landholders (small and marginal farmers) as well as the overall impact on the socio-economic development of the farmers based on the information compiled from 50 mentha growers in Central Uttar Pradesh in 2007-08. Not only the majority of the farmers in the selected villages were growing mentha, but the extent of mentha cultivation on individual farm fields was also very high, at about 86 per cent of the net cultivated area. The superior product price competitiveness, lower cost of production and attractive remuneration, the best suitability under the existing rice-wheat cropping sequence, and the rising demand for mentha products in domestic and international markets, has attracted farmers in Uttar Pradesh to shift from other commercial crops such as opium, vegetables, sugarcane and spices to mentha cultivation. Assured income flow on the farm has resulted in

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improving the living standard and socio-economic status of the growers in terms of modernisation of houses, installation of own tubewells, and purchase of motorbikes and tractors. The opportunities in the form of purchase of land, and the establishment of shops and the distillation units have also emerged. Considerable increase in unproductive expenditure such as the organisation of the social ceremonies has also taken place. The bank finance has gained popularity and the role of the private money lenders has been made rudimentary. The mentha crop would sustain the growth in its cultivation as the risk and uncertainty associated with its cultivation is very less compared to other commercial crops of the area. Further increase in area is expected from irrigated but yet to be explored areas. The spread of the crop would not affect the food security of the region. However, by replacing sugarcane it does emit warning signals to Uttar Pradesh sugar industry to pay remunerative prices to cane growers for sugarcane that remains in the field for about a year. The future development strategy calls for the development of institutional arrangements for quality products (organic mint oil), water augmentation and management, and adequate infrastructure for marketing.

Comparative Economic Analysis of Vegetables under Drip and Conventional Irrigation Sysyem in Durg District of Chhattisgarh

Vijay K. Choudhary*

The study aims to examine the comparative economic analysis of vegetables under drip and conventional irrigation system in Durg district of Chhattisgarh. The study was conducted in Patan block of Durg district of Chhattisgarh State and five villages from Patan block were selected purposively on the basis of maximum area of vegetable crops under drip irrigation method. Further, on the basis of adoption of drip irrigation system, two categories of vegetable growers, namely, drip irrigation system and conventional irrigation were formulated. Ten farmers (five from both categories) from each selected village were selected randomly, thereby forming a total of 120 respondents. The data were collected through personal interview method and analysed by using appropriate analytical tools. The results of the study revealed that the drip irrigation for vegetable production is a profitable investment. The average benefit cost ratio for selected vegetables in case of drip irrigation is Rs.1:4.072 that is sufficiently higher than those of conventional methods. Significant changes in cropping pattern of selected farmers were observed during the investigation and it was found that the maximum area of drip irrigation are used for vegetable production. The use of drip irrigation in fruits and plantation crops is still not satisfactory. Hence steps should be taken to enhance the production of fruits and plantation crops under drip irrigation. Higher initial investment and inadequate

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supply of electricity are the two main reasons for lower adaptability of vegetables and fruits plantation under drip irrigation. High yield, less use of input and finally quality produce are the main reasons for adoption of drip irrigation in the vegetable production. Technology needs to be standardised and hence, more field oriented research is to be undertaken by the universities and institutions. A strict monitoring mechanism should be developed by the drip manufacturer to ensure proper maintenance and supply of adequate parts of drip irrigation system installed in the farmer's field. All financial agencies both government and non-government should enhance loan facilities at concessional rates to the farmers who are interested in the installation of drip installation system. The study also suggests that the drip irrigation system should be promoted by giving incentives in terms of more subsidy to marginal and small farmers who adopt the high-yielding variety technologies particularly in horticultural crops.

Dynamics of Horticulture Growth in India – An Analysis

Ramesh Golait and Narayan Pradhan*

The horticulture growth has paramount importance in the way of providing nutritional security, reducing poverty level and generation of employment for the rural mass. It offers not only crop diversification for the farmers, but also provides ample scope for sustaining large number of agro-based industries that provides employment in off-season. This is the reason that the *Golden Revolution* is in the offing and India has emerged as a leading player in the global scenario. As a result of focused attention, Indian horticulture has acquired a paramount position in the world horticulture map with all time high total annual production touching 185.2 million tonnes during the year 2005-06. The ongoing liberalisation and the emergence of an integrated global market have opened new vistas for the Indian horticulture. In fact, the country's main policy focus until recently was only on grains and cereals, but it has changed in recent times with the launch of the National Horticulture Mission, 2005-06. Despite the huge production strength, India had only 1.4 per cent of the total global market, with issues like traceability, market access and global standardisation being the major constraints. On the one hand there were not enough value-adding linkages to the national missions. On the other, the emerging fruit and vegetable value chains had remained sporadic in nature and were unable to face global competition. A number of turnkey projects in mushrooms and floriculture production have been established. Near self-sufficiency has been achieved in many other horticultural crops. While the impact of green revolution in India was felt mainly in assured irrigation areas, horticultural crop production has brought

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prosperity even in semi-arid zones. Horticulture is no longer a leisurely avocation and is fast assuming the position of a dynamic commercial venture.

Contract Farming of Wonder Plant (*Morinda Citrifolia*) – An Option for Livelihood Support of Farmers in Bay Islands

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Contract farming generally involves the elements as pre-agreed price between the company and the farmer, along with measures of quality, quantity, acreage to be farmed, or duration of the contract. In this system, the contractor supplies all the inputs required for cultivation, while the farmer supplies land and labour. This study was conducted by Central Agricultural Research Institute (CARI), Port Blair after sensing the opportunity of contract farming for morinda, CARI, initiated a dialogue with HIL for entering in a contract with tsunami affected farmers. *Morinda citrifolia* var. *Citrifolia*, the commonly called Noni in India, and also known as the Indian Mulberry is one of the important plants of *Rubiaceae* family. Noni's broad proliferation gives testimony to its value to traditional cultures. Morinda contain all the essential nutraceutical, the food supplement Noni and organic health drink produced by M/S Health India Ltd., Chennai, is the genuine product prepared only from *Morinda cetrifolia* fruit. In Andaman and Nicobar Islands, it is widely found throughout the coastal region and also found as weed wild along the fences and the roadsides due to its wide adaptability to hardy climatic conditions. The noni plants grow in saline soils, alkaline soils and any type of good and wastelands of coastal areas. The whole plant i.e., leaf, stem, root and fruits is known to be of commercial importance. The most important fact is that tribes of these islands are known to consume this fruit raw with common salt as well as in food. After tsunami disaster, it has been found that *Morinda* plant is surviving in affected lands. These lands become wastelands due to seawater intrusion. Further, studies at CARI shows that this plant can be used for rehabilitating the livelihood of farmers affected by Tsunami. Thus *Morinda* plant can survive particularly in seawater inundated saline soils and in all kinds of soil in Andaman and Nicobar Islands. Since, Indian economy is agricultural based, crop diversification is one popular option of optimising the limited land resources. *Morinda* plant is having its commercial potential for these islands due to its hardiness and plant having nutritional, medicinal values. Studies indicated that if *Morinda* juice is fed to poultry, it provides immunity and is rich in peptides, which is useful for proper growth. *Morinda* is rich in minerals, its leaves can be used as mulch material, which provides very good nutrition and conserves moisture. Thus, *Morinda* cultivation in crop diversification era is an important

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option due to its economic importance, environmental adaptability, increase in salt affected areas after Tsunami, and employment generation potential. This study shows that morinda ceterifolia is an economical viable proposition for coastal areas of these islands. Further, standardisation of agro techniques has found to be easy to cultivate this plant. The concept of contract farming is emerging as an option for sustainable agriculture development. Therefore in this study with the association of Health India Limited, farmers and CARI have joined the hands to induce the farmer for better livelihood. More than the 350 farmers have already signed the agreement and began with morinda cultivation in Bay Islands. The economic analysis shows the economic viability of the cultivation of this plant and is found to be highly economical. Hence, it is the viable proposition for the tsunami affected farmers.

Economic Analysis of Production of Onion in Indore District of Madhya Pradesh

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This paper makes an attempt to analyse the economics and constraints in the production of onion in Indore district of Madhya Pradesh. It examines the cost and returns, the net return, cost of production per quintal of onion, input-output ratio in the production of onion on small, medium and large size-groups of farms. Multi-stage stratified random sampling method was used for the selection of villages and onion producers. Indore block of Indore district was selected for the study and five villages were selected randomly from Indore block. The farmers were stratified into three groups viz., small (less 2 hectares), medium (2-4 hectares) and large (4 hectares and above) farms. The primary data were collected from 50 farmers pertaining to the years 2004-05. The analysis showed that on an average, the cost of cultivation per hectare of onion over cost A₁, cost B₁, cost B₂, cost C₁, cost C₂ and cost C₃ worked out to Rs.16616, Rs.17011, Rs.19161, Rs.19461, Rs. 21611 and Rs.23772, respectively. Cost of cultivation per hectare of onion showed an increasing trend with the increase in the size of farms. The average yield and gross returns per hectare increased with the increase in the size of farms, because the large sized farmers had incurred higher investment per hectare on modern inputs in the production of onion which in turn resulted into higher yield and gross returns of these farms. The return per rupee of investment of onion was higher in small size group of farms. Unremunerative prices during the peak season and lack of storage facilities were reported to be the important constraints on onion growers, besides high price of seed, fertilisers and pesticides, costly transportation and market charges, inadequate skilled

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labour and lack of information about arrivals and prices in the major consuming markets were main problems reported by onion producers. The analysis indicates that adequate input facilities and timely supply of cheaper credit by the financing agencies to the producers, processors and traders would help in increasing the productivity as well as efficiency in the marketing of the produce. Since increase in production of onion is a must for meeting domestic and export requirement and for increasing income of farmers so also for helping in increased rural employment, it is necessary to identify the thrust areas of development and prioritise the same for effective achievement of the goal at a faster rate. The study suggests the need to develop onion grower organisations in the region. In the initial stage these organisations may be formed through non-governmental organisations to avoid the negative feeling among the farmers about the functioning of government owned organisation. Government may support these organisations by providing technical, financial and incentives to strengthen them. These organisations will be helpful in providing inputs, finances, storage facilities, technical know-how, crop wise training and marketing of vegetables and may also plan developing processing units at the village level. The following are the major suggestions for further improvement in onion market (i) fixing price based on quality, (ii) regulation of crowds at peak periods, (iii) provision of storage facilities to avoid forced sales at lower price, and (iv) farmers may be given business orientation.