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## D. ECONOMIC GEOGRAPHY

### D.1 Agricultural Geography

**149. Pal, Swades,** “Spatio-Temporal Change of Crop Diversification in Murshidabad District, West Bengal”, *Geographical Review of India*, 70 (2), 2008: 185-195.

**Introduction/Objectives:** The significance of analysis of spatio-temporal changes in crop diversification lies in its usefulness for policy makers. The analysis of changes in crop diversification also reveals changing pattern of competition among various crops. Such a competition may take place between economically remunerative and ecologically supportable crop rotation system for the maintenance of soil fecundity and ecological stability. Study of crop concentration and crop diversification as a measure of the intensity of crop is considered to be helpful in determining the regional character of crops to highlight the importance of one crop over another. The paper attempts to analyse the changing scenario of crop diversification during 2002-03 and 2004-05 in Murshidabad district with this directive.

**Data Base and Methodology:** While land use data have been collected from revenue records and other government publications, population data have been collected from Census of India/West Bengal. For block level analysis crop diversification has been grouped into five categories of high, moderate, moderately low, low, and very low. Short-term variations in crop diversification have been analysed for two periods 2002-03 and 2004-05. An attempt has been made to identify the crop diversification pattern and changes therein. The crop diversification level in all five categories mentioned above has been briefly described.

**Findings:**

- (i) The emphasis on rice monoculture affects the crop diversification especially because of poor knowledge of the farming community about other possible crops.

- (ii) Different blocks exhibited rapid change in the diversification status within a short period.
- (iii) Most of the blocks where the diversification level is quite high share of other crops in the gross cropped area is quite low. Concentration of rice cultivation is very high in most of the blocks so that share of other crops remains very limited.
- (iv) Extension of irrigation facilities, introducing high yielding variations of seeds, extensive use of fertilizers, could be recommended for accelerating the processes of crop diversification in the study region.

**150. Singh Jai Bharat :** "Sustenance of livestock in Rajasthan : An Assessment", *Annals of the Rajasthan Geographical Association, XXV, 2008 : 91-101.*

**Introduction / Objectives:** Rajasthan is the largest state in the country spread over 10.74% of India. The distribution of livestock, density, breeds, milk yield and composition are quite unique in Rajasthan. Therefore, in the present paper, an attempt has been made to assess compositional changes of livestock population with ecological point of view. The main objectives are :

- i) to analyse the structure of livestock population with special reference to cows and buffaloes,
- ii) to examine the factors responsible for the compositional changes of livestock, and
- iii) to suggest strategies for conservation and sustainable development of livestock.

**Data Base and Methodology:** The paper is based on collection of primary and secondary data. The Primary data have been collected by intensive field survey through pretested schedule. Selection of 432 sample villages, have been done keeping in view the number of blocks and representation from all zones of Rajasthan. Out of 237 tehsils of Rajasthan, 70 tehsils and their 432 villages have been selected. Finally 5 households from each village (2160) and 10 households from 6 major urban centre have been taken for field survey. The primary data along with secondary data are analysed and major findings were drawn.

**Findings:** The paper on the basis of 2160 household survey from various sample villages and 60 household survey from urban centres reveals that the population of buffaloes has been increasing by 5%

even during drought and famine years while the population of other animals such as cows, goats, sheep and camels has decreased due to famines and droughts. The paper argues that the livestock rearers (31%) cited extension of indigenous breeds, which are well adopted to the local climate and can survive on normal feeding of grasses. The cattle rearers of the sample villages suggested that the livestock rearing can be a good source of regional development and sustainable development through feed and fodder management, supply of good quality bulls, revival of grazing lands, effective veterinary services, financial assistance and proper management of dependent animals.

**151. Munir, Abdul and Rukhsana.** "Spatio-Temporal Analyses of Foodgrains Availability and Agricultural Development in Western Uttar Pradesh", *Indian Journal of Regional Science*, 40(1) 2008: 1-12.

**Introduction / Objectives:** The paper has attempted the spatio-temporal analysis of food supply and agricultural development in western Uttar Pradesh. The attempt is also made to find out the relation between foodgrain availability and agricultural development.

**Data Base and Methodology:** The study is based on unpublished data obtained from Ministry of Agriculture, Department of Statistics and Economics, Government of Uttar Pradesh. The study pertains to 1971, 1981, 1991 and 2001. Food supply is analysed using foodgrain availability per head per day, calorie availability per head per day and livestock availability per 1000 population. To examine agricultural development the author has analysed the changes in land use, net sown area, irrigated area, fertilizer consumption and cropping intensity. Standard Z score of each variable is computed by using equation,  $Z_i = (X_i - \bar{X}) / \delta$ , where  $Z_i$  is the standard score of  $i^{\text{th}}$  variable,  $X_i$  original value of individual observation,  $\bar{X}$  mean of variable and  $\delta$  denotes standard deviation. Average of values of Z score (restandardised Z score) of all indicators of food supply and agricultural development is computed separately and homogenous regions are marked out. The relationship between foodgrain availability and agricultural development is also analysed district wise.

**Findings:** (i) The restandardised Z score reveals very high (> 1) concentration of foodgrains in six districts and high (0.5 to 1) in

three; (ii) Ten districts falling in south west, south east and central part record medium (-0.5 to 0.5) concentration; (iii) Saharanpur and Hatharas have low (-1 to -0.5) availability and very low (< -1) is found in five districts viz., Muzzafarnagar, Meerut, Baghpat, Ghaziabad and Moradabad; (iv) Very high (> 0.99) agricultural development is found in two regions, one in the north comprising of Saharanpur, Muzaffarnagar and Meerut and the other in the central part including Moradabad, Badaun and Bulandsahar. Two districts Bareilly and Aligarh have high (0.49 to 0.99) agricultural development; (v) Nine districts in eastern, western and southern part have medium (-0.49 to 0.49) and four in the southern part have low (-0.99 to -0.49); and six falling in the southern and western part have very low (<-0.99) concentration of agricultural development; (vi) Five districts of low foodgrain availability have very high agricultural development, six districts of medium foodgrain availability have low agricultural development, three districts of high foodgrain availability have medium agricultural development; (vii) There is no district of high foodrain availability and high agricultural development.

**152. Ray, S. K.** "Availability of Institutional Credit, Change in Cropping Pattern and Agricultural Growth in West Bengal: A District Level Analysis", *Indian Journal of Regional Science*, 40(1) 2008: 34-42.

**Introduction / Objectives:** The paper has assessed the role of Institutional Credit (IC) together with other factors on cropping pattern (CP) and agricultural growth in West Bengal. IC has served as a life blood for small and marginal farmers. They entirely depend on IC for making investment in land development, minor irrigation, farm implements and machinery and allied activities. The nationalization of Banks has resulted in increasing availability of IC in India. In this context an attempt is made to ascertain the impact of IC on agricultural development in West Bengal.

**Data Base and Methodology:** The study is based on secondary data obtained from Banking Statistics of Reserve Bank of India, Statistical Abstract and Economic Review, Government of West Bengal. The analysis pertains to fifteen districts, eight developed and seven underdeveloped. The CP is taken as a growth of non food crops. The impact of bank credit on CP during post reform

period (1970-71 to 1992-93) is calculated for all India and West Bengal using equation,  $NFA = C + aX + bD + u$  (where NFA is percentage of area under non foodgrains to gross cropped area as an index of CP, X is cooperative credit, D dummy variable, representing presence/absence of commercial credit). Three variables viz., percentage of gross irrigated area to gross cropped area, fertilizer consumption per hectare and IC (credit from commercial banks) per hectare are considered as factors affecting cropping pattern. The impact of IC on fertilizer consumption and irrigation is also estimated. Compound annual growth rate of all these three variables is computed for the period 1972-73 to 1995-96. The regression and chow tests are conducted. The four sub time periods used for the analysis are 1973-74, 1976-77, 1979-80, 1980-81 and 1986-87. Coefficient of variation of all these variables is also calculated. The direct analysis between agricultural production and IC is also made.

**Findings:** (i) Bank nationalization has made a positive and significant impact on India but positive and insignificant impact on West Bengal; (ii) All the three variables have registered significant growth in all the districts during the period under study; (iii) IC has significantly impacted the change in CP in all the districts except Coochbehar. The chow test reveals differential impact of IC on CP in most of the districts in two sub time periods. IC has significant impact on fertilizer consumption and irrigation. Thus, IC has made significant contribution CP through fertilizer consumption and irrigation; (iv) Fertilizer consumption has significantly influenced the change in CP in thirteen districts; (v) The irrigation has made significant impact on change in CP in several districts; (vi) Coefficient of variation in IC and irrigation is same that of CP; (vii) IC has significant impact not only through change in CP but also when measured directly.

**153. Rahman, Fazlur, Azizur Rahman Siddiqui and Aijaz H. Ansari.** "Diffusion of Irrigation and its Impact on Agriculture: A Case Study", *Indian Journal of Regional Science*, 40(1) 2008: 43-52.

**Introduction / Objectives:** The paper has examined the diffusion of irrigation district wise in upper Ganga Yamuna doab where irrigation has played a crucial role in the region becoming agriculturally rich. The adoption of agricultural innovations like chemical fertilizer, HYV seeds are also dependent on assured and

timely availability of water. Thus, the focus of the study is on irrigation diffusion and its impact on innovations in five districts of the region.

**Data Base and Methodology:** The study is based on primary and secondary data. Primary survey is conducted to examine the impact of diffusion of irrigation in the adoption of agricultural innovations. For this the region is divided into 5 homogenous strata and 20 sample villages were selected. Twenty percent of total i.e., 625 households were interviewed. The survey is done in 1998-99. The secondary data are obtained from District Census Handbook. The study covers the time period between 1975-76 to 1998-99. The 5 districts selected are Saharanpur, Muzaffarnagar, Meerut, Bulandsahar and Ghaziabad. The trend is found using actual, second degree and logistic curves. Z score is applied to irrigation data at tehsil level for the year 1986, 1991 and 1996 and tehsils are divided into 3 groups, high (0.5 to -0.5), medium and low levels of irrigation.

**Findings:** There is overall increase in gross irrigated area in all the districts. The diffusion follows second degree curve which is in accordance with the findings in each district. The high level of irrigation has increased from 3 tehsils in the 1986 and 4 in the later years. Medium level of irrigation is recorded in 7 tehsils in 1986 which increased to 9 in 1991 and 1996. The low level is reported in 10 tehsils in 1991 and 7 in 1991 and 1996. The area under irrigation is on increase in all the categories.

**154. Roy (Adhikari), Soma.** "A Study of Crop-Output Fluctuation in India during Post Green Revolution Period", *Indian Journal of Regional Science*, 40(1) 2008: 53-66.

**Introduction / Objectives:** The paper has analysed the fluctuation in agricultural productivity in post green revolution period so as to know the state of agricultural products security in the wake of growing population. This will help in taking up appropriate agricultural strategy.

**Data Base and Methodology:** The data are collected from Statistical abstracts, Centre for Monitoring Indian Economy (CMIE), Directorate of Economics and Statistics, Handbook of Statistics in Indian Economy. The study is conducted in three crop groups viz., total food grains, total non food grains and all crops combined. The analysis is done for all India and 15 major states. The study covers the time period of 1971 to 2001. The trend statistic of agricultural

production is computed by fitting log quadratic equation by taking 3 year moving average. The output fluctuation is also decomposed in three sources i.e., variability in area growth rate, productivity growth rate and co variance in both area and productivity growth rate. The regression equation is estimated taking instability in agricultural output as a function of 5 variables. These are percentage of Gross Cropped Area (GCA) irrigated, percentage of net cropped area under current fallow, crop base, locational base and rainfall index for the whole period (1971-2001) and second sub period (1984-85 to 2001). The cross sectional study of regression is also made for late 1970's, 1980's, and 1990's.

**Findings:** (i) The trends in instability for total foodgrains, total non foodgrains and all crops combined have declined in some states and increased or remained same in some states; (ii) India has experienced increasing instability in total non foodgrains production due to the significant increase in instability in the production of total non foodgrains in six states where as the combined effect of the performances of the major states in respect of total foodgrains and total agricultural production resulted into no significant change in their instability; (iii) The contribution of productivity variability in crop output instability of total foodgrains, total non foodgrains and all crops combined is much higher than the contribution of other components; (iv) Negative and significant (for the second sub period) relationship exist between output instability and percentage of GCA. This shows stabilizing effect of irrigation on agricultural production; (v) A statistically insignificant relationship exists between crop base and crop output instability. Similarly, current fallow and locational base has insignificant role in explaining output instability; (vi) Relationship between rainfall and instability is significant and positive in the second sub period; (vii) Cross sectional analysis reveals insignificant relationship between five variables and output instability.

**155. Pal, Swadesh.** "Intensive Agricultural Development vis-à-vis Ground Water Depletion: An Overview of Kandi Block, Murshidabad District, WB", *Indian Journal of Regional Science*, 40(2) 2008: 123-133.

**Introduction / Objectives:** An attempt is made in this paper to assess the agricultural development in relation to ground water depletion in the Kandi block of Murshidabad district of West Bengal.

The increase in population pressure has led to the conversion of beel (wetland) landscape in crop producing region. Most of the area is devoted to water intensive HYV seeds of paddy which has led to the ground water depletion. Thus, an effort is made to assess the trends in agricultural production and ground water level together with relationship between the two.

**Data Base and Methodology:** The study is based on primary and secondary data. The primary data regarding ground water status and water yielding capacity are collected by conducting interviews with farmers and local deep drillers. Secondary data are collected from meteorological stations, block and sub divisional agriculture development office and electric supply office in the study area. The analysis is done panchayat wise for the year 2005-06. There are 10 gram panchayat in the region. The agricultural development is ascertained on the basis of 3 set of factors. These are agricultural condition (7 variables), agriculture infrastructure in terms of number of tube well/hectare and output in terms of average production of aman and boro paddy. In all 10 variables are selected. Z score is calculated of each variable for each district. The average Z score of each set is calculated. For deriving composite score the weights are given to each set of variables. The weights are then multiplied with the average value. The resultant figures are added and averaged to give composite index value of each gram panchayat. The gram panchayats then divided into four categories, low (< 0.00), medium (0.00-0.075), moderately high (0.075-0.150) and high(> 0.150). The correlation coefficient is calculated separately between Crop Intensity (CI) and Ground Water Table (GWT) and between ground water table and number of tube wells (TW). The analysis pertains to time period between 2000-01 and 2005-06. The correlation values between CI and GWT and GWT and TW are integrated for the year 2005-06. The resultant r value shows excellent (>0.920), very good (0.90-0.92) and good (< 0.90) relationship between the three.

**Findings:** (i) The agricultural development is low in 4 gram panchayats, medium, moderately high and high in 2 each; (ii) Correlation coefficient shows positive relationship between CI and GWT and GWT and TW. The value of CI, GWT and TW has increased during the period of study; (iii) The integrated r value shows excellent relationship between CI, GWT and TW in 4 gram panchayats, very good in 5 and good in one.

**156. Pathania, M. S. and Vashist G. D.** “Changing Agrarian Relations in Himachal Pradesh: Status, Issues and Strategy for Future Action Plan”, *IASSI Quarterly*, 27(1,2) 2008: 31-48.

**Introduction / Objectives:** The paper has discussed the changing agrarian relations in Himachal Pradesh with focus on small and marginal farmers as they constitute 84 percent of the farmers in the state. The state had successfully implemented land reforms. But the increasing subdivision and fragmentation of land due to continuous increase in population has resulted in increase in the small and marginal landholdings. This has social and economic implications. Uneconomic size of landholdings with terraced fields is the major hurdle in the way of introducing new and improved agricultural technology. Keeping this in backdrop, the authors have analyzed the agrarian situation of small and marginal farmers.

**Data Base and Methodology:** Both primary and secondary data are analysed. The primary data are collected from the sample farms of District Kangra. The secondary data are collected from different issues of Statistical Outline, Annual Season and Crop Report and Agriculture Census of the State government. The analysis broadly pertains to 1971-72 to 2000-01.

**Findings:** (i) The number as well as area operated under marginal and small holdings registered a marked increase after 1971-72. The area and number of large and medium farms have declined; (ii) Between 1971-72 and 1991-92, the self cultivated area has increased while area leased for cultivation has decreased; (iii) During the same time period, the net sown area of small and marginal farmers has registered an increase while that of large farmers has declined; (iii) The cropping intensity has increased between 1971-72 and 2000-01, more so of small holdings showing intensive use of land. The sample study also corroborates the same; (iv) Both small and marginal farmers leased out their land on crop share basis; (v) The sample farms show high transfer of leased out land to OBC and SC tenants; (vi) Most of the land holdings are not economically viable, thereby promoting shift to non farm employment and migration to the cities. About 87 percent sampled households have land but they do not grow crops. Engagement in services, business, lack of facilities for the education of children, uneconomic and destruction of fields by wild animals are cited as reasons for not cultivating the land.

**157. Siddiqui, Shamsul Haque, Nooruzzaman and F. Rahman.** "Diffusion of Agricultural Innovation and its Impact on Socio-economic Transformation in Aligarh District, India", *Regional Symbiosis*, 16, 2008: 117-126.

**Introduction / Objectives:** The paper has assessed the level of diffusion of agricultural innovation and consequent socio-economic transformation in Aligarh district of Uttar Pradesh. The diffusion of agricultural innovation is the spread or dispersion and adaptation of new and improved agricultural practices. This not only affects agricultural productivity but also leads to the socio-economic transformation of the farmers who adopt them. Aligarh district is one of the most important agricultural area, selected as a sample for testing adoption of green revolution. In the light of this, the authors have analyzed the later agricultural development and concomitant socio-economic impacts.

**Data Base and Methodology :** The study uses secondary data collected from District Statistical Office and Block Headquarters. The analysis is done block wise pertaining to year 2001-02. For assessing level of agricultural innovation 17 indicators and for socio-economic transformation 15 variables are selected. The composite index of level of diffusion of agricultural innovation and socio-economic transformation are constructed using formula-

$$\frac{X_1\bar{X}_1/\delta_1 + X_2\bar{X}_2/\delta_2 + \dots + X_n\bar{X}_n/\delta_n}{X_1/\delta_1 + X_2 + \dots + X_n/\delta_n}$$

where  $X_1, X_2, X_n$  are the number of variables selected,  $\bar{X}$  Mean value of the variable in the entire region,  $\delta$  standard variation of each variable. The correlation coefficient between agricultural development and socio-economic transformation is also worked out.

**Findings:** (i) Out of 12 blocks, 6 blocks have high level of diffusion of agricultural innovation. These blocks cover 43.6 percent area and fall in the northern part of the study region; (ii) Three blocks covering 31.4 percent area have medium and 3 blocks covering 25 percent area have low level of agricultural innovation; (iii) Four blocks have high, 3 medium and 5 have low levels of socio-economic development; (iv) Four blocks of high levels of socio-economic development viz. Tappal, Jawan, Dhanipur and Chandaus have high diffusion of agricultural innovation; (v) Two blocks, Bijauli and Iglas have high agricultural development but medium socio-economic development; (vi) The relationship between diffusion of agricultural innovation and socio-economic development is highly positive and significant.

**158. Rehman, Hifzur, Wahab Abdul and Asif.** “ Agricultural Productivity and Productivity Regions in Ganga-Yamuna Doab” *The Geographer*, 55(1) 2008:10-21.

**Introduction/Objectives:** In the paper an attempt has been made to examine variations in crop productivity in Ganga-Yamuna Duab. Its major objective is (1) to examine the crop productivity variations of 17 major crops grown in the districts of the region during 1990-94 and 2000-04.(2) To identify the variations in crop productivity among different districts of Ganga-Yamuna Doab and how the changes in productivity have taken place from 1990-94 to 2000-04.

**Database and Methodology :** The present study is based on secondary data obtained for two points of time 1990-94 and 2000-04. The data were collected from the published records of the Directorate of Agricultural Statistics and Crop Insurance, Krishi Bhawan and the Institute of State planning, Jawahar Bhawan, Lucknow, U.P. Computation of Crop Yield Index by Yang was used to calculate productivity indices of crops.

**Findings:** (i). During the period of 1990-94, there were only four districts with low productivity, which increased to nine during 2000-04.(ii). There is a marked productivity variation, influenced by physical and socio-economic factors.(iii). Substantial variation in respect of soil-fertility is also an influencing factor.(iv). Preponderance of small and semi-medium and highly fragmented holdings is equally important in explaining productivity variation.

**159. Hanafi, Yasir Saeed and Nuzahat Fatima,** “Pulses Crisis: Uttar Pradesh”, *National Geographical Journal of India*, 53(1,2) 2007: 95-116.

**Introduction / Objectives:** The paper has assessed the district wise variations in pulses and their per capita availability in the state of Uttar Pradesh. The pulses production is found to have declined in the state. Changes in cropping pattern with prevalence of more remunerative cereal and cash crops are responsible for such a situation. Most of the farmers in the state are not aware of the potential benefits of using fallows for legume cultivation. A variety of geographical, institutional and technological factors need to be taken into account to solve the pulses crisis in the state.

**Data Base and Methodology:** The study is based on secondary sources. The data are collected from Census of India, Directorate of Economics and Statistics and Crop Insurance, Government of Uttar

Pradesh. The study covers the time period of 2002-05. Three year moving average is calculated to get the average area and production in all the 70 districts of the state. The data obtained are grouped into 5 classes viz. very high (> 1300), high (1001-1300), medium (701-1000), low (401-700) and very low ( $\leq$  400). The same procedure is adopted for different variety of pulses.

**Findings:** (i) Most of the districts (42) have medium yield with 60 percent population having per capita availability of 35.76 gm/head/day which is below the recommended unit; (ii) Pea is very important pulse crop grown in UP. The 29 districts have very high, 24 high and 17 medium production of pea with average availability of 7.8 gm/head/day; (iii) The yield of arhar, gram and masoor is moderate in the state with majority of the population having availability of 3.95 (46.60 percent population), 9.90 (66.76 percent) and 7.06 (75.64 percent) gm/head/day respectively; (iv) The yield of moong and urd is low in the state with majority districts 48 and 34 respectively reporting low yield. About 97 percent population has moong availability of just 0.50 gm/head/day while urad availability for majority (52.07 percent) is 2.71 gm/head/day.

**160. Singh, M. B. and Singh D. K.,** "Some Issues of Irrigation Development in Mirzapur District, Uttar Pradesh", *National Geographical Journal of India*, 54(1,2) 2008: 41-58.

**Introduction / Objectives:** The paper has analyzed the trends in growth of irrigation in Mirzapur district of Uttar Pradesh.

**Data Base and Methodology:** The study is based on secondary data collected from District Statistical Office, Joint Director Statistics Office, District Agriculture and Irrigation Office and block Headquarters. The analysis pertains to four periods of time i.e. 1971, 1981, 1991 and 1999 at block level. There are 13 blocks in the study area. The growth in the means of irrigation, irrigation density, orientation and need are computed. Irrigation orientation is calculated using Kostrowicki method. Irrigation requirement is calculated on the basis of rural population, cultivated area and average annual rainfall.

**Findings:** (i) The canals have been the main source of irrigation followed by tube-wells, wells, other sources (traditional sources) and tanks; (ii) The growth in canals was stagnant between 1971 and 1991 and increased thereafter. All the blocks have positive growth

in canals. Tube-wells recorded increase between 1971 and 1991 and decline between 1991 and 1999. The wells and other means are continually on increase since 1971 excepting 1981 and 1991; (iii) Low density of canals is found in the blocks in the northern Ganga plain due to good network of tube-wells while density of tube-wells is low in upland blocks. Wells are low in number in blocks falling in south western part; (iv) The intensity of irrigation is increasing continuously since 1971 with highest being in between 1971 and 1981 due to increase in number of means of irrigation. The blocks in the south and north east part of the district have low intensity while blocks in north and north western part have high intensity; (v) Intensity of irrigation is high in Rabi crops than Kharif crops but growth in intensity is high of Kharif crops due to these being fed by rain as well as irrigation; (vi) Canal irrigation is the prime mean of irrigation as its orientation is dominant (80 percent and above irrigated area) in 5 blocks and pre dominant (60 to 80 percent) in 3 blocks along with tube-wells. Thus, tube-wells are second important means and are dominant in 2 blocks and pre dominant in 1 with canals; (vii) Five blocks falling in northern and eastern Mirzapur have very high irrigation requirement, 2 western blocks have high, 3 southern and 1 central block have moderate irrigation requirement. Only one block, Nagar located in central part has low requirement.

**161. Basu, Sukla**, "Significance of Crop Residue in the Indian Context", *Geographical Review of India*, 70(3) 2008: 224-230.

**Introduction/Objectives:** The paper synthesizes the role and importance of crop residues in India. The agricultural residues are not neglected but reused for livestock feed, for biomass production, for commercial uses such as energy, building materials, and plastic and other synthetics. The study is based on Kherur Village in the district of Bardhaman, West Bengal.

**Database and Methodology:** The present study uses primary survey as the major data source. A total of 387 households have been surveyed on a sample basis. The village has nine principal habitat areas (hamlets) like Uttarpara, Dakshinpara, Purbapara, Participatory Rural Appraisal (PRA) has been employed as a research tool due to visualize, investigate, analyze and evaluate constraints and opportunities.

**Findings:** (i). Agricultural residues do not represent a worthless

waste stream but an important source for the food production system.(ii). Many residues are widely used for soil nutrient recycling and improvement purposes; it is displacing significant quantities of synthetic fertilizers on other products.(iii). The demand for alternatives to petroleum is increasing the production of bio-fuels from food crops.(iv). Agricultural wastes such as Bagasses, coconut shells, cotton stalks produce energy by burning.(v). In rural India, about 80% of rural heat energy is obtained from the burning of agricultural wastes, wood and animal dung cakes.

**162. Sultana, Salma**, “Crop Suitability: Evaluation of the soils of Mahanadi-Balason Basin, Darjeeling Himalayas”, *Geographical Review of India* 70(3) 2008: 260-270.

**Introduction/Objectives:** The present study has been carried out in a part of the Mahanadi and Balason basin of Darjeeling to pinpoint the potential and constraints of the soils through soil suitability evaluation.

**Database and Methodology:** Interpretation of Satellite data obtained from IRS IDLISS III imagery and Survey of India toposheets have been used for preparing the base maps. The physiographic soil boundaries delineated on satellite imagery have been subsequently transferred on the base map of 1:50,000 scale to prepare final soil map. Several land evaluation techniques are used in soil survey to make interpretation for various uses. Twelve soil series have been identified in the study area and mapped in six mapping units. The soil map thus prepared has been evaluated for their soil site suitability for tea, maize along with some spice crops like ginger cardamom grown in the area.

**Findings:** (i). The soil site characteristics mainly soil depth and presence of coarse fragments are the major limiting factors in tea, maize, ginger cardamom crops in the non-arable hilly terrain.(ii). They are marginally suitable and currently not suitable. After adequate soil conservation measurement these obstacles can be corrected to moderate suitability.(iii). Limitation of base saturation restricts tea crop production in the alluvial plains.

**163. Rehman, Hifzur and Rehman, Anisur.** “Crop Productivity and Productivity Region in the Rohilkhand Region”, *The Geographer*, 55(2) 2008: 16-25.

**Introduction/Objectives:** The present paper attempts to examine the crop productivity in the Rohilkhand region of Uttar Pradesh. It attempts to delineate the productivity regions and correlates with that of the factors responsible for the inter-block disparities in crop productivity.

**Database/Methodology:** Block-wise data were obtained from the District Statistical bulletin of each district. Agricultural productivity indices for all of 90 development blocks were computed by taking into consideration the area and yield of 18 major crops grown in the region for the year 1994-95 to 1998-99. Regional variations in crop productivity were computed by applying “Crop Yield Index” method devised by W.Y. Yang (1965).

**Findings:** (i). There were as many as 30 development blocks which possess high productivity with an index value more than 104.35, but out of total of 90 development blocks, 27 blocks were having productivity of medium order and 33 blocks with low crop productivity in the region. (ii). It is suggested that the attention should be given to regions marked with medium and low productivity so that the inter-block variations in productivity can be minimized.

**164. Rai, V.K.,** “Groundwater quality Assessment for irrigation in Varanasi and its environs”, *Annals of the National Association of Geographers, India*. 28(1) 2008: 73-82.

**Introduction/Objectives:** In the present study an attempt has been made to study the physico-chemical properties of groundwater for irrigation in Varanasi and its environs. For this 28 samples of groundwater were collected from different location for total dissolved solids (TDS), electrical conductivity (EC), pH, SAR and different cations and anions.

**Database and Methodology:** Both tubewell as well as hand pump water samples were collected from 28 village in 2005. The samples were procured manually. The pH and electrical conductivity were estimated using soil and water analysis kit. The samples were analysed for the concentration of chloride, carbonate, bicarbonate, sulphate calcium, magnesium, sodium and potassium.

**Findings:** (i). The 71% of the groundwater samples of the study area are within the recommended limits for irrigation. (ii). On the basis of different parameters it is noted that TDS value of 20 samples out of 28 samples were within permissible limits. (iii). Eight samples have high TDS content and their electrical conductivity values range from 750- 2250 micro mho/ cm and they are safe only with permeable soil with moderate leaching. There are 11 samples which have EC below 750 micro/ cm and are safe under practically all conditions. (iv). Out of 28 ground water samples, one sample falls under  $C_3S_2$  category of U.S. salinity diagram and is bad for irrigation, while 15 samples with medium to high salinity and low sodium fall under  $C_3S_1$  groups and other 1 sample under  $C_3S_2$  category and are of moderate quality and can be used safely only with well drained soils. (v). Other samples of ground water are good for irrigation.

**165. Singh, Gurbakhsh and Sandeep Kaur,** "Intensity of Irrigation in Jammu Province", *Punjab Geographer* 4, 2008: 77-92.

**Introduction/Objectives:** The objective of this paper is to assess the temporal and spatial variation in the intensity of irrigation in Jammu region from 1990-91 to 2000-2001. After calculating the intensity of irrigation, the study area has been divided into the regions of varied intensity of irrigation. The study also attempts to analyze the changes that have occurred over space and time.

**Database and Methodology:** It is a tehsil level study using mainly published and unpublished data collected from the revenue department of Jammu province. The data were processed and subsequently presented by suitable choropleth maps. The intensity of irrigation has been calculated by the following formula. Intensity of Irrigation = Gross Irrigated Area/ Net Sown Area X 100

**Findings:** (i). Outer plain region is very high in irrigation but as one moves to the hilly shivaliks and mountain areas the intensity of irrigation gradually declines. (ii). The entire western part of the study region comprising the tehsils of Sundarbani, Kalakota, Nowshera, Rajouri, Thanamandi, Budhal, Mundhar, Surankota, Poonch and two tehsils namely Billawar and Basholi forming the eastern part of the region always remained under low intensity of irrigation. (iii). R.S.Pura, Akhnoor and Bishnah are the three tehsils which form a group where intensity of irrigation is very high.

**166. Patil, B. D. and Patil Y. V.** “Agricultural Modernization in Dhule and Nandurbar District: A Geographical Analysis”, *National Geographical Journal of India*, 53(3,4) 2007: 57-64.

**Introduction / Objectives:** The paper has analysed the agricultural modernization in Dhule and Nandurbar districts of Khandesh region of Maharashtra. The agricultural modernization for production increase has become all the more important as the scope for increasing land under agriculture is very low. The authors have also discussed the need for land use changes.

**Data Base and Methodology:** The study is based on secondary data obtained from District Census Handbook and various reports on socio economic aspect of the region. The study pertains to two time periods viz. 1991-93 and 2001-03. The analysis is done tehsil wise. For assessing level of modernization 7 variables viz. use of tractors, tractors operated implements, harvesters, irrigation and plant protection equipments, use of fertilizers and HYV seeds per 1000 hectares of cultivated area are chosen. The composite score is calculated for each tehsil by taking ratio of value of each variable with that of value of that variable in the entire region. The degree of association between agricultural mechanization variables and land use is also worked out.

**Findings:** (i) In 1991-93, two districts out of total 10 had high degree of modernization. Five have medium and 3 tehsils which are tribal in nature have low level of modernization. The harvesting implements and pump sets have high and moderate correlation with the land use. Others have weak correlation. This shows low use of modern implements in agriculture; (ii) In 2001-03, the districts having high modernization have increased from 2 to 6. Three tehsils have registered medium and 1 low level of modernization. The indigenous traditional equipments use is also high as irrigation pump sets have high correlation with land use while others reporting weak and negligible correlation. It should however be mentioned that the chosen variables are not independent and this limits the utility of the methodology for wider application.