

DYNAMICS AND REVIVAL OF FALLOW LAND IN JHARKHAND

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Foreword

Varieties of conative natural and human activities, institutional, socio-economic, weather and climate related factors govern the use of cultivable land in developing countries. In such a context, the precluding and typical focus of policy makers have been to analyse the extent of land that is left fallow. Over years, culturable waste, land under miscellaneous trees and crops, and village commons have reduced considerably, while land that are left fallow for more than one year, but less than five years, which declined in the initial years during the period of 1950-51 to 2010-11, had increased in the recent past. A high proportion of land under fallow (current fallow and fallow other than current fallow) means that the improvements made in waste land reclamation and efforts of bringing this land into cultivation is partly negated.

In view of the above threat of increasing fallow land and to dispense with the problem, directorate of Economics & Statistics, Department of Agriculture & co-operation, Ministry of Agriculture & Farmers Welfare, Government of India assigned a study entitled "Dynamics and Revival of Fallow Land in India" (simultaneously undertaken in four states, namely: Kerala, Maharashtra, Madhya Pradesh and Jharkhand by respective Agro-Economic Research Centres under the jurisdiction of which these states are encompassed.

The report has explicable delineated and addressed the objectives of: (i) trends related to area under fallow land current and permanent in Jharkhand, (ii) Reasons for which farmers leave land fallow, (iii) Comprehend the low cost or no cost measures to reduce area under fallow land, (iv) Assert the crops suited for fallow/fragile land, and; (vi) Suggesting observation based action points. In accordance with the suggested common methodology, two districts of Jharkhand, viz., Ranchi and Ramgarh were surveyed for in depth study with sample size of 120 (i.e., 60 from each of the districts).

It can be asseverated that under the overall guidance of Prof. (Dr.) Basant Kumar Jha, Director, AERC, Bhagalpur, Dr. Rajiv Kumar Sinha, Project Leader-Cum-Research Associate has successfully completed the study with meaningful conclusion. The value and utility of any such significant socio-economic and policy study are determined by the fitness and reliability of the ground realities based inputs and information to the purpose, for which it is used. I do hope, this study report of AER Centre, Bhagalpur is a worthy example in this sense. I feel pleasure in enouncing the hope that findings of the study will certainly be effectual and instrumental for the Government of India and the State Government of Jharkhand too in their policy making process.

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4/12/17
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Preface

Land is a scarce resource, supply of which is fixed / limited for all practical purposes. At the same time, demand of land for various competing and/materialistic purposes has been continuously increasing with the increase in human population and economic growth. The land use pattern, besides having economic implications, also unclasps economic dimensions, which if ignored, can have disastrous consequences. It is embarrassing and alarming to note that there was an increase of 43.07 per cent increase in current fallows in India during the more than six decades' period of 1950-51 to 2012-13. This threat of increase in the areas under fallow lands in India needs to be effectively checked and suitably contracted by adopting region based specific measures.

Having above noted considerable fact in mind, the Ministry of Agriculture & Farmers Welfare, Government of India assigned an all-India study entitled "**Dynamics and Revival of Fallow Land in India**" during 2016-17. **AERC for Bihar & Jharkhand** was meant to undertake this study in Jharkhand. This study has been simultaneously conducted in the states of Kerala, Maharashtra, Madhya Pradesh and Jharkhand.

We solemnly extend our gratefulness to Dr. N Swaminathan, Additional Director of Agriculture (Rtd), Chennai, who proposed this study through Prime Minister's Office (PMO). We express our gratitude to Dr. Thiagu Ranganathan, the then Assistant Professor, Institute of Economic Growth, New Delhi for developing study design, schedules, etc. of this study, and enlightened us by providing expeditious inputs in response to our queries related to study as and when required. We extend our gratefulness to Professor Brajesh Jha of IEG, New Delhi, who at different stages of the study provided us desired guidelines congruously. In chalking out the study in a more meaningful way and to make it a beacon in the field of fallow land related issues, Prof. Nilabja Ghosh of AERU, Institute of Economic Growth, Delhi contributed significantly by undertaking peer review of the draft report. We are also thankful to Dr. Ghanshyam Pandey, former Research Fellow of this Project at IEG.

We express our gratitude and special thanks to the Secretary, Department of Agriculture, Animal Husbandry & Co-operative, the Director (Agriculture), Additional Chief Secretary, Planning-Cum-Finance Department, the Director (SAMETI), Sri Dipak Kumar Das (Officer on Special Duty to Development Commissioner), and the Director, Directorate of Economics & Statistics, Government of Jharkhand for extending necessary co-operation to the Research team of AERC Bhagalpur in conduct of the study. This study has been greatly enriched by discussions held with Mr. Vikas Kumar (DAO, Ranchi), Mr. Om Prakash Sinha (Project Director, ATMA, Ranchi), Mr. Pradeep Kumar Sarkar (BTM, Kanke block, Ranchi), Mrs. Nikhat Praveen (BTM, Namkum block, Ranchi), Mr. Anuranjan Singh (Project Director, ATMA, Ramgarh), Mr. B D Agrawal (President, Grameen Sewa Sangh, Ramgarh), Mr. Chandramouli (BTM, Ramgarh), Mr. Sanjay Kumar of Ranchi and Krishak Salahkars of the four blocks in two selected districts. Our Complimentary acknowledgements are also there for all the surveyed respondents, who genuinely spared their most valuable time with the Research team and provided ground realities about fallow land.

We are thankful to all the members of the Project team of the AER Centre, Bhagalpur, whose lucid exposition on fallow land based investigation and inquests were of great assistance. We must hope that the findings of the study will explicate the threat related to fallow land and provide diagnostic measures for policy interventions.

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Executive Summary

Introduction

It is depressing and anxiety creating that there was an increase of 43.07 per cent in current fallows in India during the more than six decades' period of 1950-51 to 2012-13. So, this threat of increase in area of current fallow lands in India needs to be effectively checked and suitably tackled by adopting 'observation based' region specific measures.

With the adoption of the nine fold classification since 1950-51, an element of non-comparability has been pushed in the data before and after that year. For instance, in the old land utilization classification, the term current fallows included the land lying fallow even up to a period of 10 years in the former Bombay State, and for 02 (two) years in the former Punjab State, whereas in the revised nine fold classification, the current fallows have been limited to the lands lying fallow for one year only, and the term other fallow land includes land lying fallow for more than one year, but less than five (05) years. Thus, the areas under current fallows in the old fivefold classification need not necessarily add up to two sub-classes in the new classification, i.e., current fallows and other fallow land. Some of the lands lying fallow beyond five years may have been included in the nine fold classification as culturable waste.

The PCI of Jharkhand is not only much less than the all-India average, but is lesser than most of the states of the country. It is higher than only five states of the nation, namely; Bihar, UP, MP, Manipur and Assam. However, its growth rate is not only higher than the all-India average, it is lower, or behind the growth rates of only three states of India, namely; Gujarat, Mizoram and Tripura. The performance of Jharkhand in the last five years, i.e., during 2011-12 to 2015-16, has been better than the performance of the country as a whole. While the GDP of India grew at an average annual rate of 6.8 per cent (CAGR), the GSDP of the state grew at the average rate of 8.80 per cent per annum during the period. It is vouch safe to suggest that all possible measures should be taken up for expanding irrigation facilities, enhancing yield of cereals, (paddy, wheat) and coarse cereals, and to effectively check the increasing threat of fallow land in Jharkhand.

The state of Jharkhand has nearly 34.70 per cent of the area under total fallow out of its total geographical area of 79.70 lakh ha. It is a matter to be worried that a high proportion of land is under fallow (current fallow and fallow other than current fallow). It means that the improvements made in wasteland reclamation and efforts for bringing these lands into cultivation, is partly negated. It is, therefore, desirable to augur the dynamics of fallow land and suitable and possible measures to be taken up for its revival. In this light, the study has its own discreet and high relevance.

Objectives

The study encircles following objectives:

- i. To discuss the trends related to area under fallow land (current and permanent) in Jharkhand.*
- ii. To find out reasons for which farmers are leaving the land fallow.*
- iii. To comprehend the low cost, or no cost measures to reduce area under fallow land.*
- iv. To assert the crops suited for cultivation in fallow/fragile land, and;*
- v. To suggest observation based action points.*

Chapter Scheme

All the objectives of the study have been addressed by encompassing the following chapters:

Chapter – I	:	Introduction
Chapter – II	:	Methodology, Concepts and Definitions
Chapter – III	:	Extent of Fallow Land in State
Chapter – IV	:	Results of Primary Survey
Chapter – V	:	Conclusion ad Policy Implications

Methodology, Concepts and Definitions

The point of anxiety is that a little less than the percentage of NAS is the magnitude of current fallow (21.76%), i.e, 1,08,217 ha. No doubt, NSA of Ranchi district in percentage terms is more than the state's scenario (17.37%), however, on the fronts of fallow lands other than current fallow, and current fallow, the district faces an alarming situation as compared to the states figures (15.75%, 21.76%, 14.07% & 17.38%) respectively. More than 60 per cent of the population is rural based and their livelihood depends solely on agriculture and allied activities. About 82 per cent of the households have holdings of less than 2 hectares with the average holding size being 1.18 hectare. Only 0.84 per cent of the households have land holdings greater than 10 hectares. NAS in Ramgarh district is very low estimated at 7,779 ha (5.56%) against state's figure of 17.37 per cent. Area under current fallow is 30,166 ha (21.55%) almost similar to Ranchi district in percentage terms, but well above the state's figure (17.38). Scheduled Caste comprised 11.20 per cent of the total population, whereas ST were 21.19 ;per cent showing that like Ranchi district, Ramgarh district is also tribal dominated. At the first stage of sampling, the total fallow land as a percentage of total land reported was kept at least 2.00 per cent. Further, at the second stage, from out of those districts, which came under the criteria, the districts with highest fallow land and lowest fallow land were selected. At the third stage of sampling, as per the suggested methodology, Ranchi district (from out of the districts with highest fallow land 1,70,709 hectares) and Ramgarh district with 47,577 ha of total fallow land (from out of the class of districts with lowest fallow land) were selected for in depth study. At the fourth stage of sampling, in each of the districts selected, two blocks have been selected based on the average of fallow land (for the recent year, for which the data was available). The two blocks with highest fallow land have been selected. Having followed this criterion, Kanke and Namkum blocks under Ranchi district and Gola and Patratu blocks under Ramgarh district, have been selected. At the fifth stage of sampling, from each of the selected blocks, two villages/village clusters have been randomly selected. The villages selected in Ranchi district are: (i) Pattagain and (ii) Chama-Barhu (under Kanke block) and (i) Garke and (ii) Plandu (in Namkum block). Villages selected for detail study in Ramgarh district are: (i) Rola and (ii) Baman Sangatu (under Gola block) and (i) Armadag and (ii) Jumra (under Patratu block).

For the state of Jharkhand only, the criteria of minimum of 10 hectares of current fallow land and 15 farm households, who have left land current fallow, were suggested. At the sixth stage of sampling, from each of the villages/village clusters, 15 farmers, who had left the land fallow over a year/current fallow, have been surveyed. Thus, the total sample was (2 villages x 2 blocks x 15 Hhs x 2 districts = 120).

Extent of Fallow Land in State

It is interesting to note that during the 14 years' period of 2001-02 to 2014-15, the state of Jharkhand witnessed an increase of 2,11,427 ha in its area under fallow lands other than current fallows. It is stimulating to note here that 11.20 per cent of the total reported area was under fallow lands other than current fallow and 18.18 per cent were under current fallows categories in the year 2001-02. Both the types of fallows comprised **29.60 per cent** of the total reported area. In the year 2014-15, areas under the two types of fallows were 14.07 per cent and 17.38 per cent respectively. Both the

categories of fallow land taken together accounted for **31.45 per cent** of the total reported area. CAGR of fallow lands other than current fallow remained at 1.43 per cent during the later period; though it was 0.11 per cent lower than the previous duration's CAGR 1.54 per cent. Having a glance on the data of CAGR calculated for the two periods i.e., 2000-10 and 2010-16 in regard to different land use categories in Jharkhand, it is evident that area under non-agricultural uses showed a decline of 1.57 per cent in the later period. There was a fall of 0.02 per cent in barren and unculturable land during the later period (2010-16). It is interesting to note that during the former period, i.e., 2000-10, there was a decline of 2.16 per cent in net area sown (NAS), which went up to 4.99 per cent during the later period. Having shown an increase of 0.85 per cent during the former period, CAGR of current fallows revealed a decline of 4.33 per cent during the later period.

Except Hazaribagh and Ranchi districts, there was no change in CAGR of reported area for land utilization. The CAGR calculated for the period 2001-02 to 2014-15 meant for these districts declined by 13.11 per cent and 19.02 per cent respectively. Areas under forests in the two districts also fell by 9.00 per cent and 17.16 per cent respectively. Area under non-agricultural use indicated falls in 16 districts, which varied from 0.11 per cent to 30.22 per cent. CAGRs of only six districts showed positive change in regard to net area sown (NAS). These districts were: Garhwa, Jamtara, Kodarma, Palamu, Sahibganj and Saraikela Kharsawan (1.52%, 6.29%, 4.05%, 4.68%, 11.16%, and; 13.25%) respectively. 50.00 per cent of the total districts, i.e., 12 witnessed increases in CAGR on the LUC of culturable waste land. Its percentages varied from 0.10 in case of Godda to 59.09 for Latehar district. On the LUC of fallow land other than current fallow, most of the districts, i.e., 17 out of 24, revealed increases in CAGR. The percentages of CAGR varied from 1.42 in case of Hazaribagh to 82.25 in case of Jamtara. In regard to current fallows also, a little less than 50 per cent of the total districts, i.e., 11 out of 24, showed positive CAGR. The increases in areas of current fallows varied from 1.09 per cent in case of Khunti to 34.15 per cent in East Singhbhum district. In regard to current fallows, during the TE 2001-02 to 2003-04 and 2012-13 to 2014-15 --- Bokaro, Dhanbad, Garhwa, Gumla, Hazaribagh, Jamtara, Latehar, Lohardagga, Palamau, Ranchi, Sahibganj, Simdega and West Singhbhum revealed declines. Geographical area of Jharkhand was 7,970.075 thousand hectares in the year **2000, when it came into existence**. It remained the same in the year 2010-11. The area of Ranchi district was 758.394 thousand ha in the year 2001-02, which declined to 497.306 thousand hectare in 2010-11. The reason for this reduction in area of Ranchi district may be as a result of creation of Ramgarh district in the year 2006-07. Geographical area of Ramgarh district in the above noted two periods was 139.998 thousand hectares Data in the table embodies the fact that both the districts moved towards urbanizations during the period 2001-02 to 2010-11.

Data endorse encouraging declines in areas under current fallows in 15 out of total 24 districts over the period. Jamtara, East Singhbhum and Hazaribagh districts showed highest declines/falls in areas under current fallows (5.79%, 4.30% and 3.27%) respectively. On the overall level, during the period, decline in current fallows was quite high at 13.09 per cent. Ranchi, Koderma, Hazaribagh and Godda were the major districts that needed special attention in regard to larger declines in NAS (3.82%, 3.73%, 2.95% and 1.87%) respectively. Taking the case of state as a whole, the decline in fallow land other than current fallows was found at 10.42%. 13 districts of the state indicated declines in areas under non-agricultural uses. Hazaribagh, Koderma and Ranchi (4.80%, 4.70% and 3.05%) respectively were prominent among them. So, there is need to make special efforts for checking the alarming declines in areas under non-agricultural uses.

It can be expounded that Ranchi district had much higher NAS in the year 2014-15 (23.44%) as compared to Ramgarh district and the state of Jharkhand as a whole (5.56% and 17.35%) respectively. Cropping Intensity (CI) of Ranchi district was higher (129.97%) than Ramgarh district and state average in the year 2001-02. But, in 2014-15, CI of Ramgarh (201.85%) was more than Ranchi district and state average (104.06% and 112.22%) respectively. It can be contended that highest percentages of NAI in the state of Jharkhand during the years 2000-01, 2005-06 and 2010-11 were from canals and tanks (43.97, 44.34 , 32.00, and; 31.20, 31.13, 22.40) respectively. Next important

sources of irrigation were canals and tanks, others and tube wells. Percentage of potential created (PC) to ultimate potential (UP) was nearly 2.78 times more in case of major and medium irrigation schemes than that of minor irrigation (39.74 and 14.29) respectively. Similarly, percentage of potential utilized (PU) to PC was quite higher in regard to major and medium irrigations as compared to minor irrigation schemes (60.03 and 48.99) respectively. On overall level meant for the state of Jharkhand, these were 27.50 per cent and 57.28 per cent respectively.

As far annual rainfall in Jharkhand is concerned, except significant variations i.e., declines during the years 2005-06, 2009-10 and 2010-11, it has remained more or less similar during the 16 years' long period of 2001-02 to 2016-17. Numbers of drought affected districts in the state were as high as 24,24,22,22,20 and 15 in the years 2009-10, 2010-11, 2005-06, 2015-16, 2004-05 and 2003-04 respectively. It is to be noted here that total number of districts in Jharkhand is 24.

Results of Primary Survey

On overall level, the three farm size classes had total population of 715, 260 and 28 respectively. In Ramgarh district, no sample farm household belonged to medium or large categories. Sex ratio (per female) was found maximum in marginal farm households for Ranchi district (1.31), small farm households both in case of Ramgarh district and at overall level (1.38 and 1.34) respectively. It is seen that in both the districts I & II, i.e., Ranchi and Ramgarh and at state level, means both surveyed districts taken together, number of households' family members in the age bracket up to 14 years were highest 219, 211 and 430 respectively. Across the farm size categories, the picture emerged, displays that maximum households' family members belonged to the age bracket of up to 14 years followed by 15 to 59 years and 60 years & more age brackets, meant for both the districts and at overall level. Concludingly, it can be noted that surveyed households of the selected districts were dominated by young population, i.e., up to 14 years of age.

Enthusiastic picture is enunciated in regard to education level. In regard to data of all sampled farmers, highest number of members of households surveyed had education level of graduate and above meant for Ranchi Ramgarh and overall levels (17, 17 & 34) respectively. Numbers of illiterate/below primary level members of surveyed households were the minimum in all the three cases. Having taken both the districts together, the average size of operational holdings of surveyed marginal, small, medium and all sampled farmers were counted as: 1.88 acres, 3.20 acres, 5.06 acres and 2.30 acres respectively. Across the districts, Ramgarh (district-II) did show a little bigger size of average operational holding than that of district - I (2.50 acres and 2.10 acres) respectively.

It is found that on all sampled farmers level for the two districts, the average family size of surveyed farm households was 8.36. District-I (Ranchi) had a bit larger family size (8.45) than district-II, Ramgarh (8.27). Across the farm size categories data indicates that among the marginal farm households, family size of district-II was a little bigger than that of district-I (8.32 & 8.31) respectively. The fact that agricultural labour contributed highest share on all sampled farmers' level in the composition of total income in district-I, i.e., Ranchi (Rs. 12,223=33) could be countenanced. The lowest share was from salaries (Rs. 4,166.67). Across farm size analysis shows that medium farm households earned highest income from livestock, small farmers by working as agricultural labourer (Rs. 15,975/-) and again medium farms earned as casual labour (Rs. 15,000/-) only. In percentage terms also, income from agricultural labour was the major contributor (31.10%) followed by casual labour and livestock (27.98% and 25.59%) respectively. In regard to district-II, i.e., Ramgarh, there is sufficient ground to mean that on all sampled farmers' level, agricultural labour and income earned through it, was the most significant contributor in composition of total income (Rs. 12,690/-) i.e., 32.62 per cent of the total from all sources. Across farm size analysis also reveals the source of agricultural labour as the most important for both marginal and small farm households (29.80% and 35.87%) respectively. Data confirmed that except medium farm households of Ranchi district (100%), surveyed farmers took more loans from non-institutional sources in both the surveyed districts. Majority of the farmers belonging to marginal, small and medium categories

availed higher proportions of loan amounts in productive purposes in districts - I & II (93%, 95%, 100% and 96.67% and 98.33%) respectively. It reveals that in the study area, sample farm households, most of whom belonged to marginal and small farm classes, did have easier access to non-institutional sources of credit. While 12 and 1 farm households in Ranchi district were found to possess diesel and electric pumps respectively, in Ramgarh district, numbers of the two irrigation assets were 12 and 2. On all sampled farmers' level, except area under fallow in case of district-II, i.e., Ramgarh (1.95 acre), there was not much difference on the parameters of average number of plots and irrigated areas in districts - I & II. These were 1.90, 0.54 acre, 1.85 acres and 0.55 acres) respectively. Across the farm size data reveal higher average number of plots in case of small farm households in both the districts 2.1 & 2, larger irrigated areas for higher farm size classes (3.40 acres in medium farms of district - I and 0.85 acre for small farm households in district - II. Larger areas under fallow in case of small farms of both the districts (2.44 acres and 2.35 acres) respectively were viewed.

On the all sampled farmers' level, land owned and average size of holdings in district - I, i.e., Ranchi were estimated at 126 acres and 2.10 acres respectively, whereas in district - II i.e., Ramgarh, these were 150.44 acres and 2.51 acres. The overall sizes were found to be 276.44 acres and 2.30 acres. In both the districts, marginal farm households owned larger total areas. In district - I, it was followed by medium farm Hhs. On all sampled farmers' level, it is observed that percentages of irrigated area were 100 in the two districts and at overall level. Total irrigated areas in districts I & II and at overall level, were estimated at 32.65 acres, 33.22 acres and 65.87 acres respectively. Much larger proportions of land were found to have been occupied by food grains in the two surveyed districts (97.37% and 95.83%) respectively. Across the farm size, larger percentages of irrigated areas were viewed in cases of marginal farm households of district - I and at overall level (50.38 & 45.65), but in regard to small farms of district-II, it was 59.

Areas of fallow lands owned by the surveyed farm households of Kanke, Namkum, Gola and Patratu blocks were estimated at 49.50 acres, 43.58 acres, 49.45 acres and 67.77 acres respectively. There is ground to deem that surveyed farm households of Namkum block under Ranchi district had highest percentage of fallow land to total land (80.66) closely followed by Gola and Patratu blocks of Ramgarh district (79.67% & 76.69%) respectively. It can be intoned that at overall level (taking all categories together), percentage of fallow land to total owned land was 74.09 in district - I, i.e., Ranchi and 77.89 in district-II, i.e., Ramgarh. Across the farm size, marginal farm households owned highest proportions of fallow to total owned land in both the districts (80.71% & 82.19%) in districts - I & II respectively.

Percentage of fallow land to total owned land by medium farm households of Ranchi district was 32.89 as sample households of Ramgarh did not have medium and large categories of farm households. In regard to average area of fallow land, small farm households of both the districts were ahead (2.44 acres and 2.36 acres) respectively. Areas of fallow land owned by all categories of farm households in districts I&II were estimated at 93.35 acres and 117.04 acres, averages of fallow land being 1.54 acres and 1.95 acres respectively. No sampled farm households belonged to general category in both the districts. District-I did not have other backward class (OBC). No surveyed farm households belonged to SC also in either of the districts. Percentages of fallow land out of total owned land by the ST households in districts-I &II were 74.09 and 77.54 respectively. On overall level, these were found as 74.09 and 77.89 respectively. In district-I, 73.75 per cent and 20.89 per cent of land areas were found fallow in case of marginal and small farm households, whereas in district - II, the same were 53.69 per cent and 46.31 per cent respectively. Areas under main crop, i.e., paddy were very high in district-I & II (76.15% & 72.06%) respectively, the production potential of which was limited by significantly larger unirrigated areas (74.09% and 77.92%) respectively. On overall level (i.e., taking both the districts together), OBC households were found to have owned maximum percentage of fallow land (92.32). In regard to farm size wise criteria and irrigation front, larger concentrations of fallow land were viewed in case of marginal households (62.59%) and unirrigated area (76.17%) respectively.

Average areas of rabi fallow were calculated as 1.02 acres and 1.20 acres respectively. It is brought to view that paddy was the major kharif crop grown in kharif season (95.95 acres and 108.4 acres) in districts – I & II respectively. Larger proportions of total rabi fallow were seen in case of paddy followed by maize and Arhar in districts – I & II (102.79%, 92.62%, 18.01% 21.06%, 10.63% and 9.50%) respectively. At all kharif crop level, areas in districts – I & II were 97.37 per cent and 95.95 per cent respectively. Having essayed data related to on previous crops grown before fallow land, it is revealed that greater proportion of land areas were allocated to paddy crop only by marginal, small and medium farm households (125.05 acres, 68.15 acres and 11.15 acres) respectively. Sampled farm households will return to farming, if they are provided with assured irrigation facility, timely availability of credit, insurance and improved output markets (100%, 100%, 98.83% and 58.33%) respectively. Prudent analysis suggests that lack of assured irrigation was rated as one of the most prominent reasons for leaving land fallow with average rating of 4.46 and standard deviation (SD) of 55. The next important reasons were lack of watershed or similar efforts, which could recharge ground water (1.98) with SD of 44, surface runoff (1.96) with SD 42, no access to easy credit (1.92) with SD 30 and moved to other occupations (particularly during the rabi season), which were more profitable (1.90) with SD 61.00.

Policy Prescriptions

Based on the analysis of preceding chapters and observation based ground realities during survey, following discreet measures have been suggested for countering the menace of increasing fallow land in Jharkhand:

- i. Irrigation facility needs to be expanded by way of making existing structures of irrigation functional and expediting “**Prime Minister Krishi Sinchai Yojana (PMKSY, 2015)** in a time bound manner.
- ii. Since Jharkhand has undulated topography, so there is need to check the run-off of water by emphasizing on watershed development structures with active participation of the farmers of respective command areas of watershed schemes.
- iii. Sensitization of **formal credit institutions** is the need of the hour along with the tracking of applications to make available required agricultural credit in time. Relaxation may be provided to farmers by reducing procedural complexities. Disposal of such applications may be made in **targeted form and camp mode**.
- iv. With the view to remove the threat of open grazing, particularly during post-kharif season, ‘**Kanji Houses**’ for stray animals may be formed under the control of local bodies.
- v. Quite often fallow lands are the results of land degradation, which may be checked by providing soil test facility in close vicinity of the farms.
- vi. To promote cultivation in fallow lands, some specific crops i.e., pulses like arhar, kulthi and millets (comprising bajra, sanwa, madua, jowar, kodo, gondli, etc.) suited to the respective agro-climatic regions may be grown. It will be in tune with the proposal of the Hon’ble Union Minister of Agriculture & Farmers Welfare, Government of India, to the United Nations for declaring the year 2018 as ‘International Year for Millets). This may be made possible by giving farmers **Kit support through the Government**.
- vii. Contract farming for such lands may be helpful in reducing the extent of fallow land.
- viii. A **DPR may be formulated for revival of permanent fallows and unculturable wastelands** and its implementation may be made in **mission mode**.
- ix. In the land areas not suitable for crop production, farmers may be encouraged and provided assistance for undertaking timber and/horticultural plants. For this, some incentives may also be considered by the respective departments.
- x. Last but not the least, **liquor intake**, particularly by male members of tribal families, is widely prevalent in life style of Jharkhand. This brings reluctance in farm and social activities, particularly among male cultivators resulting in land left fallow despite their proven physical strength and high working efficiency. **Appropriate Awareness Drive** may be undertaken in this regard by involving **GOs and NGOs**.

CHAPTER – I

INTRODUCTION

1.1 Introductory

The study of land use dates back to as early as eighteenth century and most of these studies are based on rural-agro resources. *Adam Smith (1776), Alfred Marshall (1890)* were some of the pioneers of the early land use studies. Their works are still serving as foundation of most of the present day theories. It is to be mentioned here that LD Stamp was one of the greatest workers in land use studies. His valuable work has provided primary guidelines to the Geographers and planners to carryout research work in land use in different parts of the world. In United States, land survey was carried out to record the use of selected land unit, as well as, to assess the degree of limitations to land use. A Comprehensive Handbook on Landuse was published in 1961 (*Klingebiel & Montgomery, 1961*), *Hudson (1971), Young (1976), Olson (1974)* of US Department of Agriculture have contributed a lot in this regard. In 1963, the Canadian Land Inventory Unit did the land capability assessment in Canada to provide basis for resource and land use studies. Gradually the countries like Britain, USA, Canada, France, Poland, Italy, etc. are concentrating on land use studies. Having been inspired by the classical work of Stamp, the Indian Geographers also initiated land use studies in different parts of the country. Having been prompted by the land use studies, India also felt the need to have estimates, details/records of land use wise classification. *Chatterjee (1941)* pointed out the agency of land use study in India. According to him, different types of land use and land cover reflect an intricate pattern, which needed geographical investigation in respect to their physical environment.

Prior to contemplating the Dynamics and Revival of Fallow Land in Jharkhand, or in any region of the country, it will be desirable to briefly explicate broad categories of operated areas. Land is a scarce resource, supply of which is fixed for all practical purposes. At the same time, the demand of land for various competing purposes is

continuously increasing with the increase in human population and economic growth. Land use pattern at any given time is determined by several factors, including (i) size of human and livestock population, (ii) the demand pattern, (iii) technology in use, (iv) cultural traditions, (v) the location and capability of land, (vi) institutional factors, like: (a) ownership pattern, (b) rights and, (c) state regulation. The land use pattern, besides having economic implications, has also important economic dimensions, which if ignored, can have disastrous consequences.

If we have a glance on the land use statistics for the 62 years' long period (from 1951-52 to 2012-13), it is revealed that there are normal to significant declines in areas not available for cultivation; barren and unculturable land, other uncultivated land excluding fallow land, land under miscellaneous tree crops and groves not included in net area sown (NAS), culturable waste land, fallow lands, and fallow lands other than current fallows (7.95%, 54.72%, 47.46%, 84.06%, 45.16%, 6.54% and 36.97%) respectively (table 1.1). But on the other hand, it is depressing and anxiety creating that there was an increase of 43.07 per cent in current fallows in India during the more than six decades' period of 1950-51 to 2012-13. So, this threat of increase in area of current fallow lands in India needs to be effectively checked and suitably tackled by adopting observation based region specific measures.

Table No. 1.1: Agricultural Land by use in India (1950-51 to 2012-13)

		<i>(Million Hectares)</i>		
SN	Classification	1950-51	2012-13 (P)	Change (In %)
1.	Geographical area	328.73	328.73	0.00
2.	Reporting area for LUS (1to5)	284.32	305.94	7.60
3.	Forest	40.48	70.01	72.95
4.	Not available for cultivation (A+B)	47.52	43.74	(-)7.95
	a. Area under Non-agricultural uses	9.36	26.45	182.59
	b. Barren and un-culturable land	38.16	17.28	(-)54.72
5.	Other uncultivated land excluding fallow land (A+B+C)	49.45	25.98	(-)47.46
	a. Permanent pasture and other grazing land	6.68	10.24	53.29
	b. Land under miscellaneous tree crops and groves not included in net area sown (NAS)	19.83	3.16	(-)84.06
	c. Culturable waste land	22.94	12.58	(-)45.16
6.	Fallow lands (A+B)	28.12	26.28	(-)6.54
	a. Fallow lands other than current fallows	17.45	11.00	(-)36.96
	b. Current fallows	10.68	15.28	43.07
7.	Net area sown (6-7)	118.75	139.93	17.84
8.	Total cropped area (gross cropped area)	131.89	194.40	47.40
9.	Area sown more than once	13.51	54.47	303.18
	I. Cropping Intensity*	11.07	138.92	25.07
	II. Net irrigated area (NIA)	20.85	66.10	217.03
	III. Gross irrigated area (GIA)	22.56	92.58	310.37

*Cropping intensity is the percentage of gross cropped area (GCA) to net area son (NAS)

Land Use Classification

Till 1949-50, land area in India was classified into five categories known as fivefold land utilisation classification. These categories were (i) forests,, (ii) area not available for cultivation, (iii) other uncultivable lands, excluding current fallow, (iv) fallow lands, and; the net area sown (NSA). This fivefold classification was, however, a broader outline of land use in India and was not found adequate enough to meet the needs of agricultural planning in the country. States were also finding it difficult to present comparable data according to this classification owing to the lack of uniformity in the definitions and scope of classification covered by these five categories. With the view to remove the non-comparability and to break up the broad categories into smaller constituents for better understanding, or inclusiveness, the Technical Committee on Agricultural Statistics set up in 1948 by the Ministry of Food & Agriculture recommended a nine fold land use classification replacing the old fivefold classification. It also recommended standard concepts and definitions for all the states to follow. The tabular presentation below gives the nine fold classification and its relationship with the old fivefold classification.

Table No. 1.2: Classification Adopted for Land use Statistics

SN	Old Classification	SN	New Classification
1.	Forests	1.	Forests
2.	Area not available for cultivation	2.	Land put to non-agricultural uses
3.	Other cultivable land excluding current fallows	3.	Barren and unculturable land
4.	Fallow lands	4.	Permanent pastures and other grazing land
5.	Net area sown	5.	Miscellaneous tree crops and groves not included in the net area sown
		6.	Culturable waste
		7.	Fallow land other than current fallows
		8.	Current fallows
		9.	Net area sown (NAS)

Under both classifications, the total of these classes adds up to the reporting area. All the states, except West Bengal in principle, had accepted and adopted the revised classification since 1950-51. In respect of West Bengal, the data are still presented on the basis of the old classification. It is a matter to be envisaged that the land use classification described above is primarily based on whether a particular area is cultivated, grazed or forested. Its main purpose is to show the distribution in detail of the existing land according to its actual use, and not how a particular piece of land

can be potentially utilised. Thus, the area under culturable waste land does not represent the area, which is really culturable, as it may not be possible to bring under cultivation large part of the area, except at huge cost. Thus, the potential land use classification would depend upon the suitability of different areas for different purposes or uses taking into account (i) their natural endowments, (ii) the availability of capital and other resources for the development of land for desired use, and; (iii) likely economic returns. With the view to aver potential use of the land a large amount of data relating to the inherent characteristics of each soil type and the economics of putting it to a particular use would have to be specially collected through soil surveys, land use surveys and waste land utilisation surveys.

Here, it is desirable to have a brief and momentum glance on some of the overlapping concepts of fallow land as contained in the old and new classifications. With the adoption of the nine fold classification since 1950-51, an element of non-comparability has been pushed in the data before and after that year. For instance, in the old land utilization classification, the term current fallows included the land lying fallow even up to a period of 10 years in the former Bombay State, and for 02 (two) years in the former Punjab State, whereas in the revised nine fold classification, the current fallows have been limited to the lands lying fallow for one year only and the term other fallow land includes land lying fallow for more than one year, but less than five (05) years. Thus, the area under current fallows in the old fivefold classification need not necessarily add up to two sub-classes in the new classification, i.e., current fallows' and other fallow land. Some of the lands lying fallow beyond five years' may have been included in the nine fold classification as culturable waste.

1.2 Review of Literature

The inevitability of a comprehensive Review of Literatures (ROLs) is well evident for any research programme. Primary purpose of ROL is to have an overview of the nature, extent broader horizon and circumference of related studies. The purpose is also to ascertain the levels, acceptability and/rejection of theoretical and empirical works that have already been conducted in the past, or are being currently

undertaken in the areas directly, or indirectly related with the Research theme. Besides providing eagle-eyed in regard to the statement of the problem being studied, ROL offers insights into current conceptual and methodological issues. It also throws up the limitations of research works undertaken in the past, and the issues that have not yet been resolved. The ROL, thus, helps in setting the future design of research agenda and prepare to face methodological challenges likely to be faced. In view of the above, an effort has been made in section-2 of this chapter to review the available literatures. In addition to these, an attempt has also been made to document major findings of different studies both in India and abroad. It will be desirable to delineate here that fallow land is one of the important ingredients of land use pattern (LUP), so, the ROLs to be documented will have inputs related to LUP also.

Changes in land use pattern in India during the 13 years, period (from 1950-51 to 1963-64) under the 1st, 2nd and three years of third five year plans were studied by (*Giri, 1966*). He found increases of 3.7 per cent and 29.5 per cent in current fallow and area under non-agricultural uses respectively. Forest area, barren and uncultivated land, old fallow and culturable waste showed declines to the tune of 0.7 per cent, 1.4 per cent, 30.7 per cent and 29.4 per cent respectively. The fall in old fallow and culturable waste land and their utilization were encouraging features, but increase in current fallow was a disturbing one.

Analyzing the dynamics of land use pattern in Bihar, Punjab and at all India level during 40 years period of 1950-51 to 1990-91 (*Singh & Vasisht, 1997*) found that barren and uncultivated land had increased in Bihar as compared to 1960-61. The area under non-agricultural uses had been increasing continuously in the state of Bihar and in India as a whole, whereas in Punjab it was constant after 1960-61. On the one hand, increasing trend in area under fallow land in Bihar was revealed thereby resulting in decrease in Net Sown Area (NSA), thus it indicated decline in overall area put under agricultural uses. On the other hand, area under fallow land had been decreasing in Punjab.

While studying the environmental problems in hill districts of Nepal through multi-objective farm planning, (*Pant & Pandey, 1999*) warned that raising cash farm income through vegetable production was relatively more environmental friendly than raising food grain production in hills. The study also revealed that the unrestricted grazing of cattle in the hills was one of the major problems, which could be reduced by allocating some land for cattle fodder.

Having examined the spatial pattern of land use and cover as a basis for the analysis of socio-economic causes of the change in the environment and environmental consequences of land use and cover change in Ghana (*Agyepong & Sosthenes, 2003*) observed two major land uses and cover types, namely; crop lands and fallows. The forest cover was completely eliminated; about 50 per cent of land was under active cultivation, whereas 30 to 40 per cent was fallow. They further found that land cover conversion was complete in fallow, whereas grasses and other weed invasion were complete.

While essaying the dynamics of land use pattern in Tamil Nadu, (*Ramasamy et. Al, 2005*) found that the most disturbing trend in the land use pattern in the state was sharp increase in other fallow from 6.58 lakh hectare in 1950s to 11 lakh hectare in 1990s. Consequently, area under total fallow lands surpassed 20 lakh hectare during the last two decades, which accounted for 15 per cent of the total geographical area of the state, and more than 1/3rd of the Net Sown Area (NSA) (a) Increase in farm size, (b) non-agricultural income, and; (c) labour shortage had strong positive impact on extent of fallow lands, whereas (i) the credit availability, and; (ii) irrigation facilities were found to reduce the extent of fallow lands at the farm level.

On examining differences that existed between the migrant and indigenous farmers of Northern Ghana with regard to factors affecting agricultural land use between 1984 and 2000 (*Cadjoe, 2006*) found that affluence predicted agricultural land use for both migrant and indigenous farmers in 1984, and household size and fallow period predicted land use for migrants and indigenous farmers respectively.

Nadkarni & Deshpande (1979) studied the level of under utilization of land (current fallow, other fallow and culturable waste) in Karnataka and Maharashtra and found that the culturable waste accounted for the largest chunk of underutilized land followed by current fallows. The extent of underutilization of land was less than the national level in normal years, but came close to all-India level during drought years.

Sharma (2002) conducted a study on wasteland in Manipur and found that non-practice of crop rotation and keeping the soil as fallow areas exposed the soil or the fields to wind and water erosion. These were the main causes of conversion of fertile lands into wasteland in Manipur. Use of crop rotation, mulching, minimum use of inorganic chemicals, planting of appropriate medium sized trees in the fields etc., to improve the waste lands in the area were suggested by him.

Anonymous (2003), in a study of different states and having reviewed various articles found that till then, 30 per cent of total reported area of Indian Himalayas was classified as fallow, uncultivable and unculturable land. The acreage devoid of tree cover or poor grazing value could be considered as abandoned land. He also found that in the states like; Himachal Pradesh and Meghalaya more than 30 per cent of reported area was classified as uncultivable land and suggested to enhance the utility of these areas by raising the cropping intensity.

Place et.al (2004), explored the development, dissemination, adoption and impact of improved tree fallows in rural Western Kenya. The results suggested that improved fallows almost always doubled the on-farm maize yields and indicated that the poor households used improved fallows at much greater rate (about 30%). Despite these promising signs, the improved fallow systems were not found to be linked to improved household level food security, primarily because the size of fields was, on an average, quite small. They concluded that due to small farm sizes, the ability of farmers, to set aside land, even for a season was limited. Hence, the average size improved fallow was small among adopting farmers.

Chadha et.al (2003), found that current fallow registered an overall increase from fifties to nineties accompanied by an increase in the nineties at a rather higher rate of 0.7 per cent per annum. It was also found by them that the cultivable or even cultivated land was being transferred to the non-agricultural uses in certain states typically those having high urban and/industrial growth. There was a scope for better agricultural land management in the states of Andhra Pradesh, Himachal Pradesh, Tamil Nadu and Gujarat, where both fallows and culturable waste had been on rise.

Vries & Molden (2002) studied the implications of land and water degradation for food security and concluded that land use did not necessarily lead to degradation, not even intensive land use. Proper short term investment in inputs and long term investment in structure and equipment can conserve soil and water, while allowing productive and sustainable agricultural land use.

Environmental damage to land resources was studied by *(Iyenger, 2003)*. He found that rise in human and livestock population and development of modern agriculture had led to degradation of land and environment.

Linkages between women, natural resources and the domestic economics of poor rural households in India were studied by *Rani (2003)*. It was found that migration of men to urban areas and increased family responsibility on women was the other factors, which led to the degradation of natural resources.

Wiebe (2003), in his study found that land quality and land degradation affected agricultural productivity. The study suggested that land degradation did not threaten food security at the global scale, but did pose problems in the areas, where soils were fragile, property rights were insecure and farmers had limited access to information and markets.

Tenancy markets could impact the amount of land left fallow by farmers *(NITI Aayog, 2016)*. It further noted that lack of appropriate and quick tenancy reforms

predispose farmers to prefer leaving the land fallow rather than leasing it out to farmers.

It will not be out of order here to confide that a high proportion of land under fallow (current fallow and fallow other than current fallow) means the improvements made in wasteland reclamation and efforts of bringing this land into cultivation is partly negated. As a proportion of Net Sown Area (NSA), the fallow lands have increased from 13.7 per cent in 1970-71 to 17.4 per cent in 2010-11, i.e., an increase of 3.7 per cent in 40 years. In particular, the current fallow land as a percentage of NSA was 7.5 per cent in 1970-71, which rose as high as 10.1 per cent in 2010-11. Part of the reason might be that farmers are abandoning low quality land and intensifying cultivation in the high quality land. But, this cannot be the only reason, and increasing fallow lands is a concern among policy makers given its potential implications on farm income and food security.

Though macro-level studies in India have focussed on issues related to extent of fallow land and factors determining it (*Giri, 1966; Nadkarni & Deshpande, 1979; Ramasamy et.al 2005; Bardhan & Tewari, 2010*), however, there have been few studies at farm household level, which have analysed the reasons for land left fallow.

Fallow land or sometimes, land abandonment has been studied across different countries in the recent past (*Benayes et.al, 2007; Sikor et.al, 2009; Baumman et.al, 2011; Diaz et.al., 2011; Sauer et.al., 2012; Prischepov et. al 2013; Renwick et.al; 2013 Yan et.al. 2016*). Any micro-level studies could not come across that analysed factors affecting land being left fallow by farmers in the Indian context.

1.3 Relevance of the Study

A variety of institutional, socio-economic and weather related factors govern the use of cultivable land in developing countries. In such a context, the typical focus of policy makers has been to analyse the extent of land that is left fallow. Reduction in uncultivated cultivable land is critical given the rising need for land required for non-agricultural purposes. The uncultivated land is classified into many types, land

that are left fallow in the current year (current fallow), land that are left fallow for more than one year, but less than five years (fallow other than current fallow), land that are left fallow for five or more years including the current year means (culturable waste), land under miscellaneous groves and trees, and land involving permanent pastures/meadows, grazing land and pastures. Over years, culturable waste land under miscellaneous trees and crops, and village commons have reduced considerably, while lands that are left fallow for more than one year, but less than five years, which declined in the initial years have increased in the recent past.

The state of Jharkhand has nearly 34.70 per cent of the area under total fallow out of its total geographical area of 79.70 lakh ha. It is a matter to be worried that a high proportion of land under fallow (current fallow and fallow other than current fallow) means that the improvements made in wasteland reclamation and efforts of bringing these lands into cultivation is partly negated. It is, therefore, desirable to augur about the dynamics of fallow land and suitable and possible measures to be taken up for its revival. In this light, the study has its own discreet and high relevance.

1.4 Objectives of the Present Study

The study encircles following objectives:

- i. To discuss the trends related to area under fallow land (current and permanent) in Jharkhand.*
- ii. To find out reasons for which farmers are leaving the land fallow.*
- iii. To comprehend the low cost, or no cost measures to reduce area under fallow land.*
- iv. To assert the crops suited for cultivation in fallow/fragile land, and;*
- v. To suggest observation based action points.*

1.5 Chapter Scheme

All the objectives of the study have been addressed by encompassing the following chapters:

Chapter - I	:	Introduction
Chapter - II	:	Methodology, Concepts and Definitions
Chapter - III	:	Extent of Fallow Land in State
Chapter - IV	:	Results of Primary Survey
Chapter - V	:	Conclusion ad Policy Implications

CHAPTER – II

METHODOLOGY, CONCEPTS AND DEFINITIONS

2.1 Concepts and Definitions

Before describing methodological part of this study, it will be desirable to mention a brief but circumspect concept of the terms being used in 'land use statistics (LUS).' So, with a view to comprehend thin line differences between the terms of LUS, compendious description of the nine fold classification and definitions of some commonly used terms have been discussed hereunder:

1. Forest area

This includes all land classified either as forest under any legal enactment, or administered as forest, whether state-owned or private, and whether wooded or maintained as potential forest land. The area of crops rose in the forest and grazing lands or areas open for grazing within the forests remain included under the "forest area."

2. Area under Non-agricultural Uses

This includes all land occupied by buildings, roads and railways or under water, e.g., rivers and canals, and other land put to uses other than agriculture.

3. Barren and Un-culturable Land

This includes all land covered by mountains, deserts, etc. Land, which cannot be brought under cultivation except at an exorbitant cost, is classified as un-culturable, whether such land is in isolated blocks or within cultivated holdings.

4. Permanent Pasture and other Grazing Land

This includes all grazing land whether it is permanent pasture/meadows or not. Village common grazing land is included under this category.

5. Land under Miscellaneous Tree Crops, etc.

This includes all cultivable land, which is not included in 'Net area sown,' but is put to some agricultural uses. Land under casuring trees, thatching grasses, bamboo bushes and other groves for fuel, etc., which are not included under 'Orchards,' are classified under this category.

6. Culturable Waste Land

This includes land available for cultivation, whether taken up or not taken up for cultivation once, but *not cultivated during the last five years or more* in succession including the current year for some reasons or the other. Such land may be either fallow or covered with shrubs and jungles, which are not put to any use. They may be accessible or inaccessible and may be in isolated blocks or within cultivated holdings.

7. Fallow Land other than Current Fallows

This includes all lands which were taken up for cultivation, but is temporarily out of cultivation for a period of not less than one year and not more than five years.

8. Current Fallows

This represents cropped area, which is kept fallow during the current year.

9. Net Area Sown

This represents the total area sown with crops and orchards. Area sown more than once in the same year is counted only once.

10. Definitions of some commonly used Terms

i. Geographical Area

The latest figures of geographical area of the State/Union Territories are as provided by the Office of the Surveyor General of India

ii. Reporting Area for Land Utilization Statistics

The reporting area stands for the area for which data on land use classification is available. In areas where land utilization figures are based on land records, reporting area is the area according to village papers i.e., the papers prepared by the village accountants. In some cases, the village papers may not be maintained in respect of the entire area of the state. For example, village papers are not prepared for the forest areas, but the magnitude of such area is known. Also there are tracts in many states, for which no village paper exists. In such cases, estimates of classification of area from *Agriculture Census, 2000-01 and 2005-06* are adopted to complete the coverage.

iii. Gross Cropped Area

This represents the total area sown once and/or more than once in a particular year, i.e., the area is counted as many times as there are sowings in a year. This total area is also known as total cropped area or total area sown.

iv. Area Sown more than once

This represents the areas on which crops are cultivated more than once during the agricultural year. This is obtained by deducting Net Area Sown from Gross Cropped Area.

v. Irrigated Area

The area is assumed to be irrigated for cultivation through such sources as canals (Govt. & Private), tanks, tube-wells, other wells and other sources. It is divided into two categories:

(a) Net Irrigated Area

It is the area irrigated through any source once in a year for a particular crop.

(b) Total Net Un-irrigated Area

It is the area arrived at by deducting the net irrigated area from net sown area

vi. Total/Gross Irrigated Area

It is the total area under crops, irrigated once and/or more than once in a year. It is counted as many times as the number of times the areas are cropped and irrigated in a year.

vii. Total Gross Un-irrigated Area

It is the area arrived at by deducting the gross irrigated area from the gross sown area.

viii. Cropping Intensity

It is the ratio of Total Cropped Area to Net Area Sown i.e., TCA/NAS.

ix. Agricultural Land/Total Culturable Land/Total Cultivable Area/Total Arable Land

This consists of net area sown, current fallows, fallow lands other than current fallows, culturable waste land and land under miscellaneous tree crops.

x. Total Un-cultivable Area/Land

It is the area arrived at by deducting the total cultivable area from the total reported area.

xi. Total Cultivable Area/Land

This consists of net area sown and current fallows.

xii. Total Un-cultivated Area/Land

It is the area arrived at by deducting the total cultivated area from the total reported area.

2.2 Methodology

Methodology of the study encompasses the following descriptions/components:

- i. Description of the Study Area, (ii) Sampling Framework (selected districts and blocks along with number of farmers sampled), (iii) Selection of districts, (iv) Selection of blocks and talukas, (v) Selection of villages, and; (vi) Selection of households (hhs).
- ii. Statistical Techniques Used

Apart from simple tabular and percentage methods, a well determined and given list of reasons for leaving land fallow in the study area have been analysed by using (i) average rating and (ii) standard deviation (SD) of the ratings.

Compound Annual Growth Rate (CAGR) is a term for the geometric progression ratio that provides a constant rate of growth over a time period. It dampens the effect of volatility of growth that can render arithmetic means irrelevant.

CAGR in Land use for all districts of the state from secondary data between current years and base year have been drawn by using the following formula for Excel sheet:

(End value/start value)... (1/periods)-1

2.3 Description of the Study Area

2.3.1 Jharkhand: Background

Economy

The growth in Jharkhand is all pervasive. All the sectors and most of the sub-sectors of the economy have recorded impressive growth in the last five years i.e., 2011-12 to 2015-16). Though income and per capita income (PCI) of the state are low in comparison to rest of the country, its growth rate is higher than most of them. The PCI of Jharkhand is not only much less than the all-India average, but is lesser than most of the states of the country. It is higher than only five states of the nation, namely; Bihar, UP, MP, Manipur and Assam. However, its growth rate is not only higher than the all-India average, it is lower, or behind the growth rates of only three states of India, namely; Gujarat, Mizoram and Tripura.

Except Electricity, Gas & Water and manufacturing sectors, growth rates in terms of GSDP estimation (in %) of different sectors/subsectors of the economy of Jharkhand at constant prices in the old (2004-05 as base year) and New series (2011-12 as base

year) during the period 2011-12 to 2015-16 were quite encouraging and positive. In the year 2015-16, growth rates of: (i) Agriculture/crop, (ii) Fishing, (iii) Forest & Logging, (iv) Construction, (v) Railway, (vi) Hotel and Restaurant, (vii) Communication, and; (viii) Public Administration were recorded at (16.10% , 9.00%, 7.50%, 11.00%, 16.60%, 24.60%, 18.20%, and 3.50%) respectively.

The performance of Jharkhand in the last five years, i.e., during 2011-12 to 2015-16, has been better than the performance of the country as a whole. While the GDP of India grew at an average annual rate of 6.8 per cent (CAGR), the GSDP of the state grew at the average rate of 8.80 per cent per annum during the period.

Employment Scenario

As per Census 2011 report, out of the total main & marginal workers estimated at 1,30,98,274, cultivators constituted 29.12 per cent, agricultural labourers 33.87 per cent, household workers comprised only 3.48 per cent, and other workers were almost similar to agricultural labour, i.e., 33.53 per cent. Out of the total population of 3,29,88,134 in Jharkhand (as per 2011 Census) 2,50,55,073 (75.95%) comprised rural population, while 79,33,061 (24.05%) were urban ones.

Education

In the rural areas, literacy rate on overall level was 61.10 per cent, whereas in urban areas, it was much higher at 82.30 per cent. On overall level, the literacy rate of Jharkhand is estimated at 66.40 per cent, Male literacy rate 76.80 per cent was much higher than the Female literacy rate 55.40 per cent.

Land Use

Out of the total geographical area 79.71 lakh hectares, 38 lakh ha i.e., 47.67 per cent is total cultivated area, whereas net sown area is measured at 25.75 lakh ha 28.08 per cent. Percentage of current fallow land 11.12 per cent was found higher than: (i) other fallow land, (ii) barren lands, (iii) area under non-agricultural use, (iv) pasture and other grazing land, and; (v) cultivable waste land (8.46, 7.20, 8.60, 2.48 and 3.44) respectively.

Out of the total cultivated area, i.e., 38 lakh ha, only 3.007 lakh ha (7.91%) is irrigated. Cropping intensity of the state was 116. About 29.20 per cent of the area is covered by forests. (Source: Annual Plan (2016-17), Government of Jharkhand).

In the absence of sufficient irrigation facilities, agriculture in Jharkhand remains primarily dependent on monsoon for its irrigational requirements.

Crops Grown

In Jharkhand, 2.65 million hectares (mha) of land was under food grains' production, which was 2.16 per cent of the all-India area under food grains that produced 4.09 Million Tonnes (MT), i.e., 1.62 per cent of the national production showing yield of 1,540 kg/ha as compared to 2,056 kg/ha of all-India average (as per date of 2015-16). Under paddy, the area was 1.59 mha with production of 2.88 MTs displaying productivity of 1,814 kg/ha much lower than the all-India average of 2,404 kg/ha. Wheat is also grown, but in small area of 0.16 mha, produced only 0.27 MTs, and the yield rate was estimated at 1,701 kg/ha as compared to all-India average of 3,093 kg/ha (as per data of 2015-16). In regard to coarse cereals, the state had only 0.30 mha of land area under it, with production of 0.38 MTs and productivity level of 1,268 kg/ha as compared to 1,596 kg/ha of all-India average yield.

In view of the above noted data based analysis, it is vouch safe to suggest that all possible measures should be taken up for expanding irrigation facilities, enhancing yield of cereals, (paddy, wheat) and coarse cereals, and to effectively check the increasing threat of fallow land in Jharkhand.

The study area is comprised of two districts, viz., Ranchi and Ramgarh. The description of both the districts is as follows:

2.3.2 Ranchi District

Out of the total geographical area of 4,97,306 hectares of the district, 20.03 per cent is covered by forest. Net area sown (NAS) of 1,16,575 hectare comprises 23.44 per cent, whereas fallow lands other than current fallows has been estimated at 78,312 hectare (15.75%) table 2.1. The point of anxiety is that a little less than the percentage of NAS

is the magnitude of current fallow (21.76%), i.e, 1,08,217 ha. Barren and unculturable land and other uncultivated land excluding fallow land (total) did comprise lower areas with little difference in percentage terms (5.74% and 5.04%) respectively. Area under non-agricultural uses is 41,000 ha (8.24%) of the geographical area of the district (table 2.1). No doubt, NSA of the district in percentage terms, is more than the state's scenario (17.37%), however, on the fronts of fallow lands other than current fallow, and current fallow, the district faces an alarming situation as compared to the states figures (15.75%, 21.76%, 14.07%, 17.38%) respectively.

With 5,69,440 household (Hhs) Ranchi district had a population of 29,14,253 (as per 2011 Census). Out of it, male and female were 14,94,937 (51.30%) and 14,19,316 (48.70%) respectively. Total scheduled caste (SC) population was 1,52,943 (5.25%) table 2.2. Out of the total workers estimated at 11,42,867 main workers and agricultural labourers constituted 66.16 per cent and 9.08 per cent respectively. More than 60 per cent of the population is rural based and their livelihood depends solely on agriculture and allied activities. About 82 per cent of the households have holdings of less than 2 hectares with the average holding size being 1.18 hectare. Only 0.84 per cent of the households have land holdings greater than 10 hectares. Population of Scheduled Tribe (ST) in Ranchi district was 10,42,016 (i.e., 35.76%) of the total population of the district (table 2.2).

Table No. 2.1 : District Profile of Selected Districts (Area in hectare)

SN	Components	District – I Ranchi	District – II Ramgarh	Jharkhand
1.	Geographical Area	4,97,306 (100.00)	1,39,998 (100.00)	79,70,075 (100.00)
2.	Forest Area	99,584 (20.03)	42,276 (30.20)	22,39,481 (28.10)
3.	Net Sown Area	1,16,575 (23.44)	7,779 (5.56)	13,84,515 (17.37)
4.	Fallow Lands other than Current Fallow	78,312 (15.75)	23,899 (17.07)	11,21,792 (14.07)
5.	Current Fallow	1,08,217 (21.76)	30,166 (21.55)	13,85,550 (17.38)
6.	Area under Non-agricultural uses	41,000 (8.24)	17,919 (12.80)	7,05,788 (8.86)
7.	Barren and Unculturable Land	28,535 (5.74)	12,995 (9.28)	5,68,009 (7.13)
8.	Other Uncultivated Land Excluding Fallow Land	25,083 (5.04)	4,964 (3.54)	5,64,940 (7.09)

Figures in bracket indicate percentages of Total Geographical Area of the respective districts and the state.

2.3.3 Ramgarh District

Ramgarh district has the geographical area of 1,39,998 hectare. Out of it, forest area comprises 42,276 ha (30.20%), which was more than the states and Ranchi districts coverages (28.10% and 20.3%) respectively (table 2.1). NAS in the Ramgarh district is very low estimated at 7,779 ha (5.56%) against state's figure of 17.37 per cent. Area under current fallow is 30,166 ha (21.55%) almost similar to Ranchi district in percentage terms, but well above the state's figure (17.38). Barren and unculturable land in the district did have larger extent (9.28%) as compared to Ranchi district and state's figures (5.74% and 7.13%) respectively. Other uncultivated land excluding fallow land (in total) was quite lower in the district estimated at 4,964 hectare (3.54%) as compared to Ranchi district and the state (5.04 and 7.09) respectively.

Ramgarh district had the population of 9,49,443 (as per 2011 Census). Out of it, rural population comprised 55.87 per cent and urban proportion was 44.13. Scheduled Caste comprised 11.20 per cent of the total population, whereas ST were 21.19 ;per cent showing that like Ranchi district, Ramgarh district is also tribal dominated (table 2.2). Out of the total population, 3,12,125 (32.87%) were total workers. Main worker and number of agricultural labourers comprised (70.84% and 6.84%) respectively of the total workers (table 2.3).

With 4 blocks, 1 town, 344 villages and 1,344 mm. of average rainfall, Ramgarh district is situated in the Eastern Plateau Region. Number of cultivators in the district was 3,63,130 (38.25% of the total population). Agriculture is the predominant economic activity of the district. Vegetables, particularly potato, tomato, cabbage, cauliflower, etc., are grown in large tracts of Gola, Mandu and Ramgarh blocks. There are quite a few large and medium industries in the district processing and exploiting mineral resources. The district is one of the richest in the country in mineral resources. Goods' transport activity is also growing at a very past pace.

Table No. 2.2: Population and its Social Classification in Selected Districts (Census 2011)

Total	No. of Household	Total Population	Total Population		Total Population SC	Total SC		Total Population ST	Total ST	
			Total Male	Total Female		Male	Female		Male	Female
Jharkhand	6254781	32988134	16930315	16057819	3985644	2043458	1942186	8645042	4315407	4329635
Rural	4729369	25055073	12776486	12278587	3152863	1612513	1942186	7868150	3928323	3939827
Urban	1525412	7933061	4153829	3779232	832789	430945	1540350	776892	387084	389808
Ranchi	569444	2914253	1494937	1419316	152943 (5.25)	78613	74330	1042016 (35.76)	520582	521434
Rural	326235	1656918	840528	816390	84270	43088	41182	789838	395718	394120
Urban	243209	1257335	654409	602926	68673	35525	33148	252178	124864	127314
Ramgarh	179375	9494430	494230	455213	106356 (11.20)	54986	51370	201166 (21.19)	101901	99265
Rural	98829	530488 (55.87)	272167	258321	50227	25853	24374	144484	73082	71402
Urban	80546	418955 (44.13)	222063	196892	56129	29133	26996	56682	28819	27863

Table No. 2.3: Occupational Distribution of Workers in Selected Districts (Census 2011)

State/Districts	Total Working Population	Total Main Workers	Main (ALP)
Jharkhand	13098274 (39.71)	6818595 (52.06)	1238774 (9.46)
Rural	10777152	4886840	1197462
Urban	2321122	1931755	41312
Ranchi	1142867 (39.22)	756176 (66.16)	103770 (9.08)
Rural	751206	427225	95876
Urban	391661	328951	7894
Ramgarh	312125 (32.87)	221112 (70.84)	21342 (6.84)
Rural	196217	123441	19267
Urban	115908	97671	2075

NB: Figure in parentheses under total workers' column shows percentage of total population. All other figures indicate percentages of the number of total workers of respective state and the districts.

2.4 Sampling Framework

Districts have been selected based on the average total fallow land in the last 5 years i.e., from 2011-12 to 2015-16. Then the following selection criteria were used:

At the first stage of sampling, the total fallow land as a percentage of total land reported was kept at least 2.00 per cent. Further, at the second stage, from out of those districts, which came under the criteria, the districts with highest fallow land and lowest fallow land were selected. Instead of two, the Co-ordinator of the study, i.e., (IEG, New Delhi) had selected four districts under the categories of high fallow land and low fallow land. AERCs were predestined to finalize the two districts (out of the 4) based on logistical convenience.

2.5.1 Selection of Districts

At the third stage of sampling, as per the suggested methodology, Ranchi district (from out of the districts with highest fallow land 1,70,709 hectares) and Ramgarh district with 47,577 ha of total fallow land (from out of the class of districts with lowest fallow land) were selected for in depth study. Details of district selection are presented in table 2.4.

Table No. 2.4: District wise Area under Fallow & Selection of Districts (Area in ha)

District	Total Area	Current Fallow	Total Fallow	% of Total Fallow Land to Total Geog. Area
State Total	7970075	1531626.6	2558957	32.1
Gumla	534318	108687.6	172510	32.3
Ranchi	497306	103241	170709	34.3
West Singhbhum	567769	91055	167869	29.6
Giridih	493248	95619.8	160013	32.4
Palamu	460431	97579.6	157140	34.1
Dumka	377523	104508.4	149918	39.7
Hazaribagh	431315	73323.4	128287	29.7
Garhwa	428826	65047.4	121704	28.4
Deoghar	243695	76370	117707	48.3
Simdega	379434	67274.2	115623	30.5
East Singhbhum	556697	72285.4	113538	20.4
Khunti	261088	54348.8	104752	40.1
Chatara	382050	45889.4	98873	25.9
Latehar	383490	57569.8	95726	25.0
Godda	231842	69711.8	92785	40.0
Bokaro	288992	47822	90503	31.3
Sahibganj	198780	45592	83267	41.9
Dhanbad	204161	52146.8	78518	38.5
Pakur	180557	46390.8	77276	42.8
Jamatara	180704	39515	67697	37.5
Lohardaga	153621	30940.2	50453	32.8
Kodarma	156999	30844.2	49235	31.4
Ramgarh	139998	25698.8	47577	34.0
Saraikela	237231	30165.2	47276	19.9

2.5.2 Selection of Blocks

At the fourth stage of sampling, in each of the districts selected, two blocks have been selected based on the average of fallow land (for the recent year, for which the data was available). The two blocks with highest fallow land have been selected. Having followed this criterion, Kanke and Namkum blocks under Ranchi district and Gola and Patratu blocks under Ramgarh district, have been selected.

2.5.3 Selection of Villages

At the fifth stage of sampling, from each of the selected blocks, two villages/village clusters have been randomly selected. The sampling frame was preferable the list

from Ram Krishna Mission funded by ICAR for such works, Agriculture Department in Ranchi district and ATMA, and Arya Mitra of Gramin Sewa Sangh in Ramgarh district of Jharkhand state. Thus, the villages selected in Ranchi district are: (i) Pattagain and (ii) Chama-Barhu (under Kanke block) and (i) Garke and (ii) Plandu (in Namkum block). Villages selected for detail study in Ramgarh district are: (i) Rola and (ii) Baman Sangatu (under Gola block) and (i) Armadag and (ii) Jumra (under Patratu block).

2.5.4 Selection of Households

At the sixth stage of sampling, from each of the village/village cluster, 15 farmers, who had left the land fallow over a year/current fallow, have been surveyed. The sum of current fallow land that was covered in the survey of a village/village cluster was to be at least 15 hectares. For the state of Jharkhand only, the criteria of minimum of 10 hectares of current fallow land and 15 farm households, who have left land current fallow were suggested.

Apart from the household survey across farmers, who had left land fallow, a village questionnaire have also been administered with the village headman/progressive farmer(s)/village elder(s), who were competent to provide the required information (containing a total of 35 information).

Table No. 2.5: Selected Districts and Blocks along with number of Farmers

State	Districts	Blocks	No. of Farmers Sampled
Jharkhand	District-I Ranchi	Block-I, Kanke	15 x 2V = 30
		Block-II, Namkum	15 x 2 V = 30
	District – II Ramgarh	Block –I, Gola	15 x 2V = 30
		Block – II, Patratu	15 x 2V = 30
	Total Sample		= 120

CHAPTER – III

EXTENT OF FALLOW LAND IN STATE

Before throwing light on the components to be covered and discussed under different sections of this chapter, it will be desirable to mention that Jharkhand state came into existence on 15th November, 2000. In this chapter, attempt has been made to understand the extent of fallow land in Jharkhand. The following aspects related to fallow land in Jharkhand are dealt hereunder:

i. Land use pattern of the state, (ii) compound annual growth rate (CAGR) of different land use categories in the state, (iii) district wise area under various land use in TE 2001-02 to 2015-16, (iv) Features of selected districts (i.e., Ranchi and Ramgarh) and State (Jharkhand) over the period 2001-02 and 2010-11, (v) land use classification in selected districts of Jharkhand, (vi) net area irrigated (source wise) in the state during 2001-02, 2005-06 and 2010-11, (vii) ultimate irrigation potential (UIP), irrigation potential created (IPC) and irrigation potential utilized (IPU), and; (viii) rainfall and other factors associated with trends and variability for Jharkhand.

3.1 Land use Pattern of the State (Jharkhand)

Attempt has been made in this section of the chapter to encircle 'data' related to the following land use pattern (LUP) of the state of Jharkhand: (i) reporting area for land utilization statistics, (ii) forests, (iii) area under non-agricultural uses, (iv) barren and unculturable land, (v) net area sown (NAS), (vi) other uncultivated land excluding fallow land, (vii) land under miscellaneous tree crops and groves not included in NAS, (viii) culturable waste land, (ix) fallow lands other than current fallows, and; (x) current fallows:

A glance on data in the table leads us to assert that while there were no changes in the reporting areas under land utilization (79,70,075 ha), and forests (22,39,481 ha) during the period 2001-02 to 2014-15, areas under 'non-agricultural uses, NAS and current fallows declined by 52724 ha, 137431 ha and 63,080 ha respectively over the

period, i.e., during 2001-02 to 2014-15. Area under barrens unculturable land went up by 3896 ha, other uncultivated land excluding fallow land increased to 37912 ha, land under miscellaneous tree crops groves 14,962 ha and culturable waste land by 18,834 ha. It is interesting to note that during the 14 years' period of 2001-02 to 2014-15, the state of Jharkhand witnessed an increase of 2,11,427 ha in its area under fallow lands other than current fallows (table 3.1). This is the point of prime anxiety for the state.

Table No. 3.1: Land Use Pattern of the State (In ha)

Year	Reporting Area for Land Utilization Statistics	Forests	Area under Non-Agricultural Uses	Barren and Un-Cultural Land	Net Area Sown	Other Uncultivated land Excluding Fallow land	Land under Misc. Tree Crops & Groves not included in Net Area Sown	Cultural Waste Land	Fallow Lands Other than Current Fallows	Current Fallows
2001-02	7970075	2239481	758512	564113	1521946	527028	83298	334037	910365	1448630
2002-03	7970075	2239481	758512	564113	1535946	527028	83298	334037	910365	1434630
2003-04	7970075	2239481	758512	564113	1565475	527028	83298	334037	901137	1414329
2004-05	7970075	2239481	754508	464513	1475922	525975	83328	332955	968579	1441097
2005-06	7970075	2239481	756908	564513	1405860	525975	83328	332955	1026726	1450612
2006-07	7970075	2239481	757515	564113	1503565	536904	93177	334037	966476	1402021
2007-08	7970074	2239481	754480	564113	1535764	535539	93177	332671	912796	1427901
2008-09	7970074	2239481	763555	568686	1503980	538893	93334	335868	961781	1393698
2009-10	7970075	2239481	763722	568699	1250366	538912	93345	335873	1045043	1563852
2010-11	7970075	2239481	763722	568699	1085366	538912	93345	335873	1045043	1728852
2011-12	7970075	2239481	775334	563648	1249901	563537	99414	343361	1046561	1531613
2012-13	7970075	2239481	709548	571878	1405985	564841	101985	349236	1038224	1440118
2013-14	7970075	2239481	705788	568009	1383585	564940	98260	352871	1063146	1445126
2014-15	7970075	2239481	705788	568009	1384515	564940	98260	352871	1121792	1385550

Concludingly, it is stimulating to note here that 11.20 per cent of the total reported area was under fallow lands other than current fallow and 18.18 per cent were under current fallows categories in the year 2001-02. Both the types of fallows comprised **29.60 per cent** of the total reported area. In the year 2014-15, areas under the two types of fallows were 14.07 per cent and 17.38 per cent respectively. Both of the categories of fallow land taken together accounted for **31.45 per cent** of the total reported area (table 3.1).

3.2 Compound Annual Growth Rate of Different Land use Categories

This section of the chapter circumscribes Compound Annual Growth Rate (CAGR) of different land use categories (LUCs) in Jharkhand. The data has been analysed and calculated for the periods 2000-2010 and 2010-16, as the state of Jharkhand came into existence in November, 2000. The CAGR has been calculated for the following components of LUCs: (i) reporting area for land utilization statistics, (ii) forests, (iii) area under non-agricultural uses, (iv) barren and unculturable land, (v) net area sown, (vi) other uncultivated land excluding fallow land, (vii) land under miscellaneous tree crops, and grove not included under net area sown, (viii) culturable waste land, (ix) fallow lands other than current fallow, and; (x) current fallows.

Having a glance on the data of CAGR calculated for the two periods i.e., 2000-10 and 2010-16 in regard to different land use categories in Jharkhand; it is evident that area under non-agricultural uses showed a decline of 1.57 per cent in the later period. There was a fall of 0.02 per cent in barren and unculturable land during the later period (2010-16). It is interesting to note that during the former period, i.e., 2000-10, there was a decline 2.16 per cent in net area sown (NAS), which went up to 4.99 per cent during the later period. Having shown an increase of 0.85 per cent during the former period, CAGR revealed a decline of 4.33 per cent in current fallows during the later period.

No changes in CAGRs of reporting areas and area under forests could be seen during the two periods CAGRs of other uncultivated land excluding fallow land and culturable waste land increased slightly in the later period, i.e., 2010-16 as compared to former period, i.e., 2000-10 (0.95%, 0.99% and 0.25% % 0.06%) respectively. Table 3.2 CAGR of fallow lands other than current fallow remained at 1.43 per cent during the later period; though it was 0.11 per cent lower than the previous duration's CAGR 1.54 per cent (table 3.2).

Table No. 3.2: Compound Annual Growth Rate of Different Land Use Categories in the State (In %)

Year	Reporting Area for Land Utilization Statistics	Forests	Area under Non-Agricultural Uses	Barren and Un-Cultural Land	Net Area Sown	Other Uncultivated land Excluding Fallow land	Land under Misc. Tree Crops & Groves not included in Net Area Sown	Cultural Waste Land	Fallow Lands Other than Current Fallows	Current Fallows
2000-10	0.00	0.00	0.08	0.09	-2.16	0.25	1.27	0.06	1.54	0.85
2010-16	0.00	0.00	-1.57	-0.02	4.99	0.95	1.03	0.99	1.43	-4.33

3.3: District-wise Area under various land use in TE 2001-02 to 2003-04 and 2012-13 to 2014-15

Area under non-agricultural uses showed declines in 16 districts of Jharkhand during triennium ending 2001-02 to 2003 to 04 and 2012-13 to 2014-15. As far fallow lands other than current fallow is concerned, out of 24 districts, except 06 districts, namely: (i) East Singhbhum, (ii) Giridih, (iii) Godda, (iv) Palamau, (v) Sahibganj, and (vi) Saraikela Kharsawan, in remaining 18 districts increased during the period.

In regard to current fallows, during the TE 2001-02 to 2003-04 and 2012-13 to 2014-15 --- Bokaro, Dhanbad, Garhwa, Gumla, Hazaribagh, Jamtara, Latehar, Lohardagga, Palamau, Ranchi, Sahibganj, Simdega and West Singhbhum revealed declines. In remaining 11 districts areas under current fallows increased (table 3.3)

Table No. 3.3: District-wise Area under various land use in TE 2001-02 to 2003-04 and 2012-13 to 2014-15 (In ha)

S. N	Name of the Districts	Reporting Area for Land Utilization Statistics		Forests		Area under Non-Agricultural Uses		Barren and Un-Cultural Land		Net Area Sown		Other Uncultivated land Excluding Fallow land		Land under Misc. Tree Crops & Groves not included in Net Area Sown		Cultural Waste Land		Fallow Lands Other than Current Fallows		Current Fallows		
		2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	2001-02 to 2003-04	2012-13 to 2014-15	
1	Bokaro	288992	288992	74182	74182	49835	30946	24114	40311	36079	34245	17784	20813	4448	5409	8459	10547	40405	43703	46593	44792	
2	Chatara	382050	382050	216914	216914	22429	19161	10678	10108	41827.6	27238	7674	6804	1098	1351	4186	4112.67	32896.67	44585.33	49630.67	57239.67	
3	Deoghar	243695	243695	19399	19399	24279	22388	10658	17556	65648	38817	30361	33286	1923	2230	17225	19972	39871	47820	53479	64430	
4	Dhanbad	204161	204161	18927	18927	47388	49058	32587	31102	22087	12893	14108	14102	2159	2152	11377	11378	20868	44591	48196	33577	
5	Dumka	377523	377523	48871	48871	32307	32237	25885	25642	99678	71880	46690	46506	5828	5895	22481	22229	29990	51199	79051	101188	
6	East Singhbhum	556697	556697	124846	124846	146666	138649	56989	46763	86368	77909	52604	47823	5663	5416	44517	40165	42733	37037	46491	83669	
7	Garhwa	428826	428826	191161	191161	19568	24332	25193	26744	57041	58785	10746	15631	2133	3038	6468	9705	32514	51644	92603	60529	
8	Giridih	493248	493248	158533	158533	32779	32670	41045	38463	70827	60554	40801	44421	9732	9582	18084	21991	57015	56646	92249	101960	
9	Godda	231842	231842	23671	23671	23265	20661	17712	17675	59574	56548	25089	24106	9599	8593	9239	9257	31877	22238	50654	66943	
10	Gumla	534318	534318	135341	135341	23211	23844	38230	36675	126295	124024	37853	35922	5228	3337	31477	31464	58426	70841	114963	107671	
11	Hazaribagh	571312	431315	245949	203673	48262	23502	347743	19802	70280	47662	19142	16319	3710	4237	9197	7816	56934	58562	96002	61795	
12	Jamtara	180704	180704	14042	14042	22133	21511	7805	7778	36845	41628	30991	30771	1888	1709	14862	12446	12334	40966	56554	24008	
13	Kodarma	156998	156999	59353	59353	16866	8775	15289	9747	17267	18693	10286	6490	2653	1312	5502	3338	16669	27459	21269	26479	
14	Latehar	383490	383490	195018	195018	14160	12765	24489	24586	52901	49291	8605	17542	2316	3329	5109	12931	26640	40136	61677	44153	
15	Lohardagga	153622	153621	44355	44355	12057	10694	9254	9865	39718	36220	6489	8621	1284	1976	4947	6609	19501	22279	22249	21586	
16	Pakur	180557	180557	14683	14683	16987	16994	11094	10712	45576	33891	20846	2158	3857	4168	10131	10548	28874	38922	42498	43779	
17	Palamau	460431	460431	169819	169819	29265	31376	25541	26643	89170	97705	10321	11645	1618	3213	7085	5854	48965	44222	87350	79021	
18	Ranchi	758394	497306	145119	99584	63235	41000	46691	28535	205621	120278	43225	25083	7072	3852	32904	19332	124431	71549	130071	111277	
19	Sahibganj	198780	198780	28316	28316	28170	20640	10434	10239	37817	46725	15426	15614	3034	3150	8073	8121	38547	37413	40070	39833	
20	Saraikela Kharsawan	237232	237231	64972	64972	25307	22443	20488	17680	53652	68806	17350	17913	3072	3198	11699	11348	28683	15049	26780	30368	
21	Simdega	379434	379434	103674	103674	20171	21195	25028	24842	92393	85024	22255	38147	1588	15996	17488	17948	51459	56069	64454	50483	
22	West Singhbhum	567769	567769	142336	142336	40172	45787	50166	55284	134459	111007	38382	46207	3195	4995	33527	37513	52606	78362	109648	88786	
Since 2006-07																						
23	Khunti*	261088	261088	45535	45535	17938	18247	19498	19573	64414	62654	15508	14600	1003	370	12543	12968	48399	49594	49795	50886	
24	Ramgarh*	139997	139998	42276	42276	18946	18165	14407	12976	15076	8882	5359	5056	854	994	2401	1695	18870	23498	25063	29145	

**For Khunti and Ramgarh districts, TEs are meant for the periods 2006-07 to 2008-09 & 2012-13 to 2014*

3.4 District wise CAGR of different Land use Categories (2001-02 to 2014-15)

In this section, attempt has been made to find out district wise compound annual growth rates (CAGRs) of different land use categories (LUCs) in Jharkhand. The data enfolded for different LUCs are for the period 2001-02 to 2014-15, for all the districts, except Ramgarh and Khunti. These two districts came into existence later on. So, the data for these two districts are meant for the period 2006-07 to 2014-15.

Except Hazaribagh and Ranchi districts, there was no change in CAGR of reported area for land utilization. The CAGR calculated for the period 2001-02 to 2014-15 meant for these districts declined by 13.11 per cent and 19.02 per cent respectively. Areas under forests in the two districts also fell by 9.00 per cent and 17.16 per cent respectively. Area under non-agricultural use indicated falls in 16 districts, which varied from 0.11 per cent to 27.87 per cent. The districts that showed increases in regard to this LUC were (Garhwa, Gumla, Pakur, Palamu, Simdega, West Singhbhum and Khunti. CAGRs of only six districts showed positive change in regard to net area sown (NAS). These could be named as: Garhwa, Jamtara, Kodarma, Palamu, Sahibganj and Saraikela Kharsawan (1.52%, 6.29%, 4.05%, 4.68%, 11.16%, and; 13.25%) respectively. 50.00 per cent of the total districts, i.e., 12 witnessed increases in CAGR on the LUC of culturable waste land. Its percentages varied from 0.10 in case of Godda to 59.09 for Latehar district. On the LUC of fallow land other than current fallow, most of the districts, i.e., 17 out of 24 revealed increases in CAGR. The percentages of CAGR varied from 1.42 in case of Hazaribagh to 82.25 in case of Jamtara. In regard to current fallows also, a little less than 50 per cent of the total districts, i.e., 11 out of 24 showed positive CAGR. The increases in areas of current fallows varied from 1.09 per cent in case of Khunti to 34.15 per cent in East Singhbhum district. However, 13 districts out of 24 revealed fall in CAGR in regard of LUC of current fallows. The falls in areas under current fallows varied from 0.30 per cent in case of Sahibganj to 34.85 per cent meant for Jamtara district (table 3.4).

Table No. 3.4: District-wise Compound Annual Growth rates of different land use categories (2001-02 to 2014-15)

S.N	Name of the Districts	Reporting Area for Land Utilization Statistics	Forests	Area under Non-Agricultural Uses	Barren and Un-Cultural Land	Net Area Sown	Other Uncultivated land Excluding Fallow land	Land under Misc. Tree Crops & Groves not included in Net Area Sown	Cultural Waste Land	Fallow Lands Other than Current Fallows	Current Fallows
1	Bokaro	0.00	0.00	-21.20	29.29	-2.57	8.18	10.27	11.67	4.00	-1.95
2	Chatara	0.00	0.00	-7.57	-2.71	-19.30	-5.84	10.92	-0.88	16.42	7.39
3	Deoghar	0.00	0.00	-3.97	28.34	-23.10	4.71	7.69	7.68	9.52	9.76
4	Dhanbad	0.00	0.00	1.75	-2.31	-23.60	-0.02	-0.16	0.00	46.18	-16.53
5	Dumka	0.00	0.00	-0.11	-0.47	-15.08	-0.20	0.57	-0.56	30.66	13.14
6	East Singhbhum	0.00	0.00	-2.77	-9.42	-5.02	-4.65	-2.21	-5.01	-6.90	34.15
7	Garhwa	0.00	0.00	11.51	3.03	1.52	20.61	19.34	22.49	26.03	-19.15
8	Giridih	0.00	0.00	-0.17	-3.20	-7.54	4.34	-0.77	10.27	-0.32	5.13
9	Godda	0.00	0.00	-5.76	-0.10	-2.57	-1.98	-5.39	0.10	-16.48	14.96
10	Gumla	0.00	0.00	1.35	-2.05	-0.90	-2.58	-20.11	-0.02	10.11	-3.22
11	Hazaribagh	-13.11	-9.00	-30.22	-76.14	-17.65	-7.67	6.87	-7.81	1.42	-19.77
12	Jamtara	0.00	0.00	-1.42	-0.17	6.29	-0.36	-4.86	-8.49	82.25	-34.85
13	Kodarma	0.00	0.00	-27.87	-20.16	4.05	-20.57	-29.68	-22.11	28.35	11.58
14	Latehar	0.00	0.00	-5.05	0.20	-3.47	42.78	19.89	59.09	22.74	-15.39
15	Lohardagga	0.00	0.00	-5.82	3.25	-4.51	15.26	24.05	15.58	6.89	-1.50
16	Pakur	0.00	0.00	0.02	-1.74	-13.77	-67.83	3.95	2.04	16.10	1.50
17	Palamau	0.00	0.00	3.54	2.13	4.68	6.22	40.92	-9.10	-4.97	-4.89
18	Ranchi	-19.02	-17.16	-19.48	-21.82	-23.52	-23.82	-26.20	-23.35	-24.17	-7.51
19	Sahibganj	0.00	0.00	-14.40	-0.94	11.16	0.61	1.89	0.30	-1.48	-0.30
20	Saraikela Kharsawan	0.00	0.00	-5.83	-7.11	13.25	1.61	2.03	-1.51	-27.57	6.49
21	Simdega	0.00	0.00	2.51	-0.37	-4.07	30.92	17.38	1.31	4.38	-11.50
22	West Singhbhum	0.00	0.00	6.67	4.98	-9.14	9.72	25.04	5.78	22.05	-10.01
23	Khunti*	0.00	0.00	0.86	0.19	-1.38	-2.97	-39.26	1.68	1.23	1.09
24	Ramgarh*	0.00	0.00	-2.08	-5.10	-23.24	-2.87	7.89	-15.98	11.59	7.84

Table 3.5: District-wise Area under various land use (Area in ha.)

S.N	Name of the Districts	Reporting Area for Land Utilization Statistics	Forests	Area under Non-Agricultural Uses	Barren and Un-Cultural Land	Net Area Sown	Other Uncultivated land Excluding Fallow land	Land under Misc. Tree Crops & Groves not included in Net Area Sown	Cultural Waste Land	Fallow Lands Other than Current Fallows	Current Fallows
2014-15											
1	Bokaro	288992	74182	30946	40311	34146	28013	5409	10547	43703	44891
2	Chatara	382050	216914	18938	10066	37948	7023	1730	3977	47138	44023
3	Deoghar	243695	19399	22541	17556	44330	33286	2230	19972	46204	60379
4	Dhanbad	204161	18927	48563	31102	12866	14012	2152	11378	48601	30090
5	Dumka	377523	48871	32237	25642	85678	46506	5895	22229	54377	84212
6	East Singhbhum	556697	124846	138649	46763	74923	47814	5416	40156	37048	86654
7	Garhwa	428826	191161	24957	26897	43933	15795	3050	9780	56096	70017
8	Giridih	493248	156533	32666	38463	52671	44397	9582	21991	52313	114205
9	Godda	231842	23671	20661	17675	69317	24106	8593	9257	22201	54211
10	Gumla	534318	135341	24203	35945	124676	34959	2388	31463	82275	96919
11	Hazaribagh	431315	203673	24236	19952	44645	16317	4257	7874	60256	62236
12	Jamtara	180704	14042	22299	7772	39603	30779	1710	14818	43485	22733
13	Kodarma	156999	59353	8596	9765	10629	6494	1308	3331	30139	32023
14	Latehar	383490	195018	12918	24196	41567	18000	3270	13469	44103	47688
15	Lohardagga	153621	44355	9689	10145	39720	9427	2078	7324	23591	16694
16	Pakur	180557	14683	16808	10846	35404	21760	4165	10735	39255	41801
17	Palamau	460431	169819	31819	26611	91637	11506	3210	5719	47433	81617
18	Ranchi	497306	99584	41000	28535	116575	25083	3852	19332	78312	108217
19	Sahibganj	198780	28316	20745	10231	47725	15575	3150	8082	34042	42146
20	Saraikela Kharsawan	237231	64972	21559	16477	63754	17907	3259	11091	21270	31292
21	Simdega	379434	103674	19701	25228	90122	37586	15301	18113	57267	45856
22	West Singhbhum	567769	142336	45824	55335	112585	46212	4998	37502	77694	87783
23	Khunti*	261088	45535	18314	19531	62282	14628	370	12993	51101	49697
24	Ramgarh*	139998	42276	17919	12995	7779	4964	887	1738	23899	30166

Base Year (2001-02)

1	Bokaro	288992	74182	49835	24114	35447	17784	4448	8459	38451	49179
2	Chatara	382050	216914	22429	10678	49174	7674	1098	4186	22894	52287
3	Deoghar	243695	19399	24279	10658	67709	30361	1923	17225	39577	51712
4	Dhanbad	204161	18927	47388	32587	20597	14108	2159	11377	20882	49672
5	Dumka	377523	48871	32307	25885	100223	46690	5828	22481	45152	78395
6	East Singhbhum	556697	124846	146666	56989	85632	52604	5663	44517	43153	46807
7	Garhwa	428826	191161	19568	25193	56675	10747	2133	6468	32710	92773
8	Giridih	493248	158533	32779	41045	66447	40801	9732	18084	57880	95763
9	Godda	231842	23671	23265	17712	53203	25089	9599	9239	36120	52782
10	Gumla	534318	135341	23211	38230	122570	37853	5228	31477	54642	122471
11	Hazaribagh	571312	245949	48262	34734	67905	19142	3710	9197	56167	99144
12	Jamtara	180704	14042	22133	7805	37784	30991	1888	14862	15577	52372
13	Kodarma	156998	59353	16866	15289	18097	10286	2653	5502	13295	23812
14	Latehar	383490	195018	14160	24489	50565	8605	2316	5109	30308	60345
15	Lohardagga	153622	44355	12057	9254	39830	6489	1484	4947	18760	22877
16	Pakur	180557	14683	16987	11094	44700	20846	3857	10131	30729	41518
17	Palamau	460431	169819	29265	25541	88963	10321	1618	7085	48981	87541
18	Ranchi	758394	145119	63235	46691	201230	43225	7072	32904	130613	128281
19	Sahibganj	198780	28316	28170	10434	39357	15426	3043	8073	38241	38836
20	Saraikela Kharsawan	237232	64972	25307	20488	50470	17350	3072	11699	31932	26713
21	Simdega	379434	103674	20171	25028	89528	22255	1588	17488	52983	65795
22	West Singhbhum	567769	142336	40172	50166	135840	38382	3195	33527	51318	109555
Base Year (2006-07)											
23	Khunti*	261088	45535	17744	19265	64739	14648	1003	11683	50130	49027
24	Ramgarh*	13998	42276	18915	14407	14531	5358	854	2401	19668	24843

Table 3.6: District-wise Compound Annual Growth rates of different land use categories (2001-02 to 2014-15)

S.N	Name of the Districts	Reporting Area for Land Utilization Statistics	Forests	Area under Non-Agricultural Uses	Barren and Un-Cultural Land	Net Area Sown	Other Uncultivated land Excluding Fallow land	Land under Misc. Tree Crops & Groves not included in Net Area Sown	Cultural Waste Land	Fallow Lands Other than Current Fallows	Current Fallows
Current Year 2014-15, Base Year – 2001-02											
1	Bokaro	0.00	0.00	3.46	-3.60	0.27	-3.19	-1.39	-1.56	-0.91	0.65
2	Chatara	0.00	0.00	1.22	0.42	1.87	0.64	-3.20	0.37	-5.03	1.24
3	Deoghar	0.00	0.00	0.53	-3.5	3.07	-0.56	-1.05	-1.05	-1.10	-1.10
4	Dhanbad	0.00	0.00	-0.17	0.33	3.42	0.05	0.02	0.00	-5.86	3.65
5	Dumka	0.00	0.00	0.02	0.07	1.13	0.03	-0.08	0.08	-1.30	-0.51
6	East Singhbhum	0.00	0.00	0.40	1.42	0.96	0.68	0.32	0.74	1.10	-4.30
7	Garhwa	0.00	0.00	-1.70	-0.47	1.84	-2.71	-2.52	-2.91	-3.78	2.03
8	Giridih	0.00	0.00	0.02	0.47	1.67	-0.60	0.11	-1.39	0.72	-1.25
9	Godda	0.00	0.00	0.85	0.01	-1.87	0.29	0.79	-0.01	3.56	-0.19
10	Gumla	0.00	0.00	-0.30	0.44	-0.12	0.57	5.76	0.00	-2.80	-1.66
11	Hazaribagh	-1.99	-1.34	-4.80	-3.88	-2.95	-1.13	0.99	-1.10	0.50	-3.27
12	Jamtara	0.00	0.00	0.05	-0.03	0.34	-0.05	-0.70	-0.02	7.61	-5.79
13	Kodarma	0.00	0.00	-4.70	-3.15	-3.73	-3.23	-4.93	-3.52	6.02	2.14
14	Latehar	0.00	0.00	-0.65	-0.09	-1.39	5.41	2.49	7.17	2.72	-1.67
15	Lohardagga	0.00	0.00	-1.55	0.66	-0.02	2.70	2.43	2.84	1.65	-2.23
16	Pakur	0.00	0.00	-0.08	-0.16	-1.65	0.31	0.55	0.41	1.76	0.05
17	Palamau	0.00	0.00	0.60	0.29	0.21	0.78	5.02	-1.52	-0.23	-0.50
18	Ranchi	-2.97	-2.65	-3.05	-3.46	-3.82	-3.81	-4.25	-3.73	-3.59	-1.21
19	Sahibganj	0.00	0.00	-2.16	-0.14	1.39	0.07	0.25	0.01	-0.83	0.59
20	Saraikela Kharsawan	0.00	0.00	-1.14	-1.54	1.68	0.23	0.42	-0.38	-2.86	1.14
21	Simdega	0.00	0.00	-0.17	0.06	0.05	3.81	17.56	0.25	0.56	1.14
22	West Singhbhum	0.00	0.00	0.94	0.70	-1.33	1.33	3.25	0.80	3.01	-1.57
Base Year - 2006-07											
23	Khunti*	0.00	0.00	-0.39	-0.10	0.48	0.02	13.28	-1.32	-0.24	-0.17
24	Ramgarh*	0.00	0.00	0.68	1.30	8.12	0.96	-0.47	4.12	-2.41	-2.40
	State	-12.13	-12.95	-13.66	-11.21	-11.88	-11.22	-9.35	-10.79	-10.42	-13.09

3.5 District wise CAGR of Land Use: Current and Base Year Analysis

Table 3.5 contains data showing district wise areas (in hectares) under different land use categories of Jharkhand state in the base year of 2001-02 and current year, for which data was available, i.e., 2014-15. The CAGRs of all districts in regard to their land use categories have been calculated using data from this table taking into account data of current and base years only.

Attempt has been made to look upon the changes in district wise land use statistics by using Compound Annual Growth Rates (CAGRs). The period for which changes have been analysed, is 2001-02 as base year and 2014-15 as current year.

Data in table No. 3.6 endorse encouraging declines in areas under current fallows in 15 out of total 24 districts over the period. Jamtara, East Singhbhum and Hazaribagh districts showed highest declines/falls in areas under current fallows (5.79%, 4.30% and 3.27%) respectively. On the overall level, during the period, decline in current fallows was quite high at 13.09 per cent. In 13 out of 24 districts, areas under fallow lands other than current fallows' also declined during the period. Encouraging results of falls in areas under this particular land use category was visible in regard to Koderma, Dhanbad, Chatara, Garhwa and Godda districts (6.02%, 5.86%, 5.03%, 3.78% and 3.56%) respectively. Taking the case of state as a whole, the decline in fallow land other than current fallows was found at 10.42%. 13 districts of the state indicated declines in areas under non-agricultural uses. Hazaribagh, Koderma and Ranchi (4.80%, 4.70% and 3.05%) respectively were prominent among them. So, there is need to make special efforts for checking the alarming declines in areas under non-agricultural uses. It is interesting to note that only 9 districts out of 24, revealed declines in net area sown (NAS) as evident from CAGR calculated for the period 2001-02 and 2015. Ranchi, Koderma, Hazaribagh and Godda were the major districts that needed special attention in regard to larger declines in NAS (3.82%, 3.73%, 2.95% and 1.87%) respectively (table 3.6).

3.6 Features of the Districts during 2001-02 to 2010-11

The table here delineates geographical area of the state of Jharkhand and selected districts namely: Ranchi and Ramgarh in the years 2001-02 and 2010-11. It also provides the level of urbanization in case of the selected districts during the above periods. Geographical area of Jharkhand was 7,970.075 thousand hectares at the time 2000, when it came into existence. It remained the same in the year 2010-11. The area of Ranchi district was 758.394 thousand ha in the year 2001-02, which declined to 497.306 thousand hectare in 2010-11. The reason for this reduction in area of Ranchi district may be as a result of creation of Ramgarh district in the year 2006-07. Geographical area of Ramgarh district in the above noted two periods was 139.998 thousand hectare (table 3.7). Data in the table embodies the fact that both the districts moved towards urbanizations during the period 2001-02 to 2010-11. Here urbanization means percentage of people living in urban areas. In the year 2001-02, 40.36 per cent and 40.13 per cent of the total population of Ranchi and Ramgarh districts respectively were residing in urban areas. These urban populations increased to 43.14 per cent in Ranchi district and 44.13 per cent in Ramgarh district by the year 2010-11 (table 3.7). Data in the table thus helps us to count that pace of urbanization in Ramgarh district was a bit higher than that of Ranchi.

Table No. 3.7: Features of Selected Districts and State over the Period of 1990-91, 2000-01, and 2010-11

Districts	Geographical Area (in '000 ha)			Urbanisation		
	1990-91	2001-02	2010-11	1990-91	2001-02	2014-15
District I (Ranchi)	---	758.394	497.306	---	40.36	43.14
District II (Ramgarh)	---	139.998	139.998	---	40.13	44.13
State	---	7970.075	7970.075	---	22.30	24.05

NB: The Geographical area for Ranchi district is valid for 2001-02 & 2010-11, whereas initial year for Ramgarh district is 2006-07

Source: Jharkhand Economic Survey, 2015-16

While describing features of the district, it is interesting to note that right from the existence of Jharkhand, most of its districts (i.e., about 89 %) have remained droughts affected during different years. Out of the total 16 years of its creation, seven years have been experienced by most of the districts as drought affected

3.7 Land use Classification in Selected Districts

Having a glance on data containing Net area sown (NAS) as percentage of gross cropped area (GCA), it can be explicitly expounded that Ranchi district had much higher NAS in the year 2014-15 (23.44%) as compared to Ramgarh district and the state of Jharkhand as a whole (5.56% and 17.35%) respectively. Cropping Intensity (CI) of Ranchi district was higher (129.97%) than Ramgarh district and state average in the year 2001-02. But, in 2014-15, CI of Ramgarh (201.85%) was more than Ranchi district and state average (104.06% and 112.22%) respectively (table 3.8).

State average of NAS in the years 2001-02 and 2014-15 had remained quite lower at 19.09 per cent and 17.37 per cent respectively. In Ramgarh district in the year, when it came into existence i.e., in the year 2006-07, NAS was quite high (28.25%), but it significantly came down to 5.56 per cent in 2014-15. Some of the possible reasons for the fall in NAS percentage could be faster pace of urbanization, ever increasing area under coal mining and less than required monsoon rainfalls. CIs in Jharkhand were estimated at 120.65 in 2001-02 and 112.22 in 2014-15. It was higher than that of Ramgarh district, but lower than Ranchi district in 2001-02. But, in the year 2014-15, CI of Jharkhand was higher than Ranchi, and much lower than Ramgarh district.

Table No. 3.8: Land use Classification in selected districts of selected States

Districts	Net Area Sown (% of GA)			Cropping Intensity (%)		
	1990-91	2001-02	2014-15	1990-91	2001-02	2014-15
District I (Ranchi)	---	26.53	23.44	---	129.97	104.06
District II (Ramgarh)	---	28.25	5.56	---	112.11	201.85
State	---	19.09	17.37	---	120.65	112.22

NB: The Geographical area for Ranchi district is valid for 2001-02 & 2010-11, whereas initial year for Ramgarh district is 2006-07

3.8 Source wise Net Area Irrigated in Jharkhand

In this section, attempt has been made to estimate source wise Net Area Irrigated (NAI) during the years 2000-01, 2005-06 and 2010-11 in Jharkhand. The sources of irrigation include: (i) tube wells, (ii) wells, (iii) canals and tanks, and; (iv) others. Having a glance on the table, it can be contended that highest percentages of NAI in the state of Jharkhand during the years 2000-01, 2005-06 and 2010-11 were from wells

(43.97, 44.34 and 32.00) respectively. Next important sources of irrigation were canals and tanks, others and tube wells.

Canals and tanks were second major sources of irrigation accounting for 31.20 per cent, 31.13% and 22.40 per cent in the years 2000-01, 2005-06 and 2010-11 respectively (table 3.9). Other source of irrigation provided 16.31 per cent, 16.98 per cent and 26.40 per cent shares in net area irrigated during the years 2000-01, 2005-06 and 2010-11 respectively. Tube wells contributed minimum or the least percentages of NAI during the above noted three years, estimated at 9.21, 7.54 and 19.20 per cent respectively (table 3.9).

Table No. 3.9: Net Area Irrigated (Source wise) in Selected Districts of the State during Different Study periods (in Percentages)

	Well & Tube-well			Canals			Tanks			Others		
	2000-01	2005-06	2010-11	2000-01	2005-06	2010-11	2000-01	2005-06	2010-11	2000-01	2005-06	2010-11
Districts												
District I	---	---	---	---	---	---	---	---	---	---	---	---
District II	---	---	---	---	---	---	---	---	---	---	---	---
State	9.21	7.54	19.20	43.97	44.34	32.00	31.20	31.13	22.40	16.31	16.98	26.40

3.9 Ultimate Irrigation Potential, Irrigation Potential Created and Utilized

In this section of the chapter, efforts have been made to educe: (i) ultimate potential of (UP) of irrigation, (ii) potential created (PC), (iii) potential utilized (PU), (iv) percentage of PC to UP, and; (v) % of PU to PC. These irrigation potentials have been calculated and examined in regard to Major & Medium and Minor Irrigation separately. A glance on data in the table helps us to explicate that percentage of potential created (PC) to ultimate potential (UP) was nearly 2.78 times more in case of major and medium irrigation schemes than that of minor irrigation (39.74 and 14.29) respectively. Similarly, percentage of potential utilized (PU) to PC was quite higher in regard to major and medium irrigations as compared to minor irrigation schemes (60.03 and 48.99) respectively. On overall level meant for the state of Jharkhand these were 27.50 per cent and 57.28 per cent respectively (table 3.10).

UP under major and medium irrigation schemes in the state was 1,277 thousand hectares, out of it, PC was only 507.5 '000 ha (39.74%). Under minor irrigation head, the UP was 1,184 thousand ha, out of it only 169.2 thousand hectare could be brought under PC (14.29%). Having taken both major & medium irrigations and minor irrigation projects/schemes together, the UP was measured at 2,461 thousand ha, out of it only 676.7 thousand hectare potential could be created. Potential utilized to potential created for major & medium and minor irrigations were estimated at 304.7 thousand ha and 82.9 thousand respectively.

Table No. 3.10: Ultimate Irrigation Potential: Created and Utilized ('000 ha)

Irrigation Schemes	Ultimate Potential (UP)	Potential Created (PC)	Potential Utilized (PU)	% of PC to UP	% of PU to PC
Major & Medium	1,277	507.5	304.7	39.74	60.03
Minor	1,184	169.2	82.9	14.29	48.99
Total	2,461	676.7	387.6	27.50	57.28

Source: Compiled by the authors on the basis of data of CWC (2013) and Planning Commission, Water and related Statistics, December, 2013

3.10 Rainfall

Rainfall is the primary source of water, and is of great importance for the economies of the nation and the state of Jharkhand as well. It is especially significant and every time highly desired for its agricultural sector. It is highly variable over space and time, leads to flood and drought every year in one or the other parts of the country and different states as well.

As far annual rainfall in Jharkhand is concerned, except significant variation means declines during the years 2005-06, 2009-10 and 2010-11 it has remained more or less similar during the 16 years' long period of 2001-02 to 2016-17. In the year 2001-02, the actual annual rainfall was 1,270.9mm. In 2016-17 also it maintained the level of 1,264.0 mms. But, during the years 2005-6, 2009-10 and 2010-11 the state experienced significant declines with 1,004.4 mms, 970.6 mm and 806.1 mms and respectively (table 3.11). The delineation of monsoon rainfall in Jharkhand based on data in the table reveals an **spirit extinguishing scenario** in the form of quite lower recorded rainfalls during the years 2002-03 to 2005-06, 2009-10, 2010-11, 2012-13 to 2015-16. During these years, monsoon rainfalls were 959.8 mm, 818.3 mm, 928.4mm, 819 mm,

793.7mm, 648.1mm, 938.5 mm, 844.5 mm, 930.1 mm and 941.9 mm respectively (table 3.11). Frequently varying and quite lower rainfalls in different years have led to very high number of districts declared as drought affected by the State Government of Jharkhand. Numbers of drought affected districts in the state were as high as 24,24,22,22,20 and 15 in the years 2009-10, 2010-11, 2005-06, 2015-16, 2004-05 and 2003-04 respectively. It is to be noted here that total number of districts in Jharkhand is 24 (table 3.11).

Table No. 3.11: Rainfall and other factors associated with trends and variability for the selected State

years	Annual Rainfall (In mm.)	Monsoon Rainfall (In mm.)	No. of Districts declared drought affected
2001-02	1270.9	1024.7	00
2002-03	1094.9	959.8	22
2003-04	1148.2	818.3	15
2004-05	1163.3	928.4	20
2005-06	1000.4	819.0	22
2006-07	1436.3	1267.0	00
2007-08	1476.4	1271.3	00
2008-09	1270.0	1166.4	00
2009-10	970.6	793.7	24
2010-11	806.1	648.1	24
2011-12	1274.7	1160.6	00
2012-13	1102.0	938.5	00
2013-14	1253.6	844.5	00
2014-15	1156.6	930.1	00
2015-16	1085.6	941.9	22
2016-17	1264.0	1107.0	00

- Sources: i. www.imd.gov.in/rainfall
 ii. DES, Government of Jharkhand, Ranchi
 iii. Department of Agriculture, Co-operation & Farmers Welfare, Govt. of India, 2nd November, 2015

CHAPTER – IV

RESULTS AND DISCUSSIONS

Based on primary survey and data obtained in the process, attempt has been made in this chapter to comprehend and formulate analytical presentation of the following aspects: (i) distribution by gender, (ii) distribution of sampled farmers by age category wise, (iii) level of education of households (Hhs), (iv) average size of operational holding: district wise, (v) average family size of sampled farm households, (vi) composition of total income district wise, (vii) indebtedness among farmers: district wise, (viii) details of irrigation assets: district wise, (ix) information of land used for cultivation: district wise, (x) land holdings of farmers: district wise (xi) land irrigation and others: district wise, (xii) block wise extent of fallow land, (xiii) fallow land of households: district wise, (xiv) extent of fallow land: category wise: district wise, (xv) major kharif crops preceded by rabi fallow: district wise, (xvi)major rabi crops preceded by kharif fallow, and; (xii)Reasons for land left fallow.

4.1 Distribution by Gender

In district-I, i.e., Ranchi, marginal farm households (Hhs) comprised highest population (including male and female) 407. It was followed by small and medium farm Hhs-72 and 28 respectively. In district-II, i.e., Ramgarh, marginal and small farm Hhs (surveyed) were having 308 and 188 total population respectively. On overall level, the three farm size classes had total population of 715, 260 and 28 respectively. Because in Ramgarh district, no sample farm household belonged to medium or large categories. Sex ratio (per female) was found maximum in marginal farm households for Ranchi district (1.31), small farm households both in case of Ramgarh district and at overall level (1.38 and 1.34) respectively (table 4.1).

Table: 4.1: Distribution of Sample Farm Households by Gender

Districts	Sex	Farm-size Categories				
		Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
District I	Male	231	40	15	---	286
	Female	176	32	13	---	221
	Total	407	72	28	---	507
	Sex Ratio (<i>Per female</i>)	1.31	1.25	1.15	---	1.29
District II	Male	176	109	---	---	285
	Female	132	79	---	---	211
	Total	308	188	---	---	496
	Sex Ratio (<i>Per female</i>)	1.33	1.38	---	---	1.35
State	Male	407	149	15	---	571
	Female	308	111	13	---	432
	Total	715	260	28	---	1003
	Sex Ratio (<i>Per female</i>)	1.32	1.34	1.15	---	1.32

Source: Primary Survey

As far sex ratio in regard to all sampled farmers is concerned, these were: 1.29 and 1.35 for Ranchi and Ramgarh districts respectively. Male and female population in regard to all sampled farmers taken together were calculated as 286 and 221 in Ranchi and 285 and 211 in Ramgarh districts. At overall level, sex ratio was estimated at 1.32 (table 4.1).

4.2 Distribution of Sampled Farmers by Age Group

Having deliberated on data in the table, it is revealed that in both the districts I & II, i.e., Ranchi and Ramgarh and at state level, means both surveyed districts taken together, number of households' family members in the age bracket up to 14 years were highest 219, 211 and 430 respectively. Across the farm size categories, the picture emerged display maximum households' family members belonged to the age bracket of up to 14 years followed by 15 to 59 years and 60 years & more age brackets, meant for both the districts and at overall level. In regard to all sampled farmers belonging to different farm size groups taken together, numbers of surveyed households' family members were calculated as 171, 165 & 336 in 15 to 59 years bracket and 117, 120 & 237 for both the districts and at aggregate level respectively under 60 years & more age group (table 4.2). In both the districts, as no surveyed household belonged to large farm class, so total sampled farmers belonging to marginal, small and medium farm size groups only were taken into analysis.

Concludingly, it can be noted that surveyed households of the selected districts were dominated by young population, i.e., up to 14 years of age.

Table 4.2: Distribution of Sampled Farmer Households by Age Group

Districts	Age Group	Farm-size Categories				
		Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
District I	Up to 14 Years	173	32	14	---	219
	15-59 Years	136	26	09	---	171
	60 Years and more	98	14	05	---	117
District II	Up to 14 Years	129	82	---	---	211
	15-59 Years	105	60	---	---	165
	60 Years and more	74	46	---	---	120
State	Up to 14 Years	302	114	14	---	430
	15-59 Years	241	86	09	---	336
	60 Years and more	172	60	05	---	237

Source: Primary Survey

4.3 Level of Education of Households

A glimpse on data provides ground to suggest enthusiastic picture of education level. In regard to data of all sampled farmers, highest number of members of households surveyed had education level of graduate and above meant for Ranchi Ramgarh and overall levels (17, 17 & 34) respectively. Number of illiterate/below primary level members of surveyed households was the minimum in all the three cases. Farm size categories wise data gives an account of highest number of members of households surveyed to be qualified up to graduation and above belonging to marginal farmers class meant for districts-I, II & overall levels (15, 11, & 26) respectively. The reason for this was that majority of farm household belonged to marginal class in both the districts. Among small farm size group also scenario was the same. Members having education up to middle class in districts - I, II and overall level were more in number than educated up to secondary level (16, 16, 32 and 14, 14, 28) respectively (table 4.3). Thus, in regard to educational status, both the surveyed districts gave more or less similar picture.

Table 4.3: Level of Education of Sample Households

Districts	Level of Education	Farm-size Categories				
		Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
District I	Illiterate/ Below Primary Primary	10	03	---	---	13
	Middle	13	02	01	---	16
	Secondary	11	03	---	---	14
	Graduate and above	15	---	02	---	17
District II	Illiterate/ Below Primary Primary	08	05	---	---	13
	Middle	10	06	---	---	16
	Secondary	08	06	---	---	14
	Graduate and above	11	06	---	---	17
State	Illiterate/ Below Primary Primary	18	08	---	---	26
	Middle	23	08	01	---	32
	Secondary	19	09	---	---	28
	Graduate and above	26	06	02	---	34

Source: Primary Survey

4.4 Average Size of Operational Holding

Farm class wise average size of operational holdings for district - I, i.e., Ranchi, district - II (Ramgarh) and for all sampled farmers' have been analysed and dealt in this section. It has earlier been noted that no sampled household in either of the districts belonged to large farm class. Having taken both the districts together, the average size of operational holdings of surveyed marginal, small, medium and all sampled farmers were counted as: 1.88 acres, 3.20 acres, 5.06 acres and 2.30 acres respectively. Across the districts, Ramgarh (district-II) did show a little bigger size of average operational holding than that of district - I (2.50 acres and 2.10 acres) respectively. In district - I, i.e., Ranchi, average size of operational holdings owned by marginal, small and medium sampled households were found to be 1.74, 3.19 and 5.06 acres respectively. In district-II, i.e., Ramgarh, average size of operational holdings owned by marginal and small categories were calculated at 2.07 acres and

3.20 acres respectively. No farm household in district - II belonged to medium and large farm size groups (table 4.4).

Table 4.4: Average Size of Operational Holding: District-wise (In Acres)

Districts	Farm-size Categories				
	Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
District I	1.74	3.19	5.06	---	2.10
District II	2.07	3.20	---	---	2.50
Total	1.88	3.20	5.06	---	2.30

Source: Primary Survey

4.5 Average Family Size of Sampled Farm Households

Having envisaged on the data in the table, it is found that on all sampled farmers level for the two districts, the average family size of surveyed farm households was 8.36. District-I (Ranchi) had a bit larger family size (8.45) than district-II, Ramgarh (8.27). Across the farm size categories data indicates that among the marginal farm households, family size of district-II was a little bigger than that of district-I (8.32 & 8.31) respectively. District-II did not have any sampled households belonging to medium and large categories. In regard to small farm category, average family size of Ranchi district was slightly larger than that of Ramgarh district (9 & 8.17) respectively. At overall level, family size of marginal, small and medium farm categories were calculated at 8.31, 8.39 and 9 respectively (table 4.5).

Table 4.5: Average Family Size of Sampled Farm Households

Districts	Farm-size Categories				
	Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
District 1	8.31	9.00	9.33	---	8.45
District II	8.32	8.17	---	---	8.27
State	8.31	8.39	9.33	---	8.36

Source: Primary Survey

4.6 Composition of Total Income

In this section, attempt has been made to find out farm class wise and district wise composition of total income by circumscribing the components/aspects like: (i) livestock, (ii) agricultural labour, (iii) casual labour, (iv) salaries, and; (v) income

from other sources. The fact that agricultural labour contributed highest share on all sampled farmers' level in the composition of total income in district-I, i.e., Ranchi (Rs. 12, 223=33) could be countenanced. The lowest share was from salaries (Rs. 4,166.67). Across farm size analysis shows that medium farm households earned highest income from livestock, small farmers as agricultural labourer (Rs. 15,975/-) and again medium farms earned as casual labour (Rs. 15,000/-) only respectively. In percentage terms also, income from agricultural labour was the major contributor (31.10%) followed by casual labour and livestock (27.98% and 25.59%) respectively.

While income from agricultural labour was the most significant source in the composition of total income meant for marginal and small farm households, casual labour dominated in case of medium farm households (29.97%, 42.04% and 44.55%) respectively (table 4.6 (A)). One of the reasons for medium farm households earning significant amount of income from casual labour source could be their low average size of operational holdings (5.06 acres). It indicates that they could have hardly crossed the boundary line of small farm category.

Having a glance on the data in the table, in regard to district-II, i.e., Ramgarh, there is sufficient ground to mean that on all sampled farmers' level, agricultural labour and income earned through it, was the most significant contributor in composition of total income (Rs. 12,690/-) i.e., 32.62 per cent of the total from all sources. Across farm size analysis also reveals the source of agricultural labour as the most important for both marginal and small farm households (29.80% and 35.87%) respectively. Other important contributory sources in composition of total income (on all sampled farmers' level) were casual labour, livestock, salaries and income from other sources (Rs. 11,350, Rs. 9,460, Rs. 3,600/- and Rs. 1,800/-) respectively table 4.6 (B). The overall income from all sources was calculated as Rs. 38,900/- only.

Table 4.6 (A): Composition of Total Income (District – I, Ranchi)

SN	Sources of Income	Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
1	Farm Business Income	---	---	---	---	---
2	Livestock	9702.04 (24.34)	11525.00 (30.33)	12000.00 (35.64)	---	10060.00 (25.59)
3	Nonfarm Enterprise	---	---	---	---	---
4	Agricultural labor	11951.02 (29.97)	15975.00 (42.04)	6666.67 (19.80)	---	12223.33 (31.10)
5	Casual labor	11204.08 (28.10)	8250.00 (21.71)	15000.00 (44.55)	---	11000.00 (27.98)
6	Hiring out agricultural machinery/ Water sale	---	---	---	---	---
7	Rent from leased out land (i) Kind (ii) Cash	---	---	---	---	---
8	Rent from houses (if any)	---	---	---	---	---
9	Interest on deposits or lending to individuals	---	---	---	---	---
10	Salaries	5102.04 (12.80)	---	---	---	4166.67 (10.60)
11	Pensions	---	---	---	---	---
12	Remittances	---	---	---	---	---
13	Income from other sources (specify)	1908.16 (4.79)	2250.00 (5.92)	---	---	1858.33 (4.73)
	Total of all Sources	39867.34 (100.00)	38000.00 (100.00)	33666.67 (100.00)	---	39308.33 (100.00)

Source: Primary Survey

Note: Figures in parentheses show percentages to total.

Table 4.6 (B): Composition of Total Income (District – II, Ramgarh)

	Sources of Income	Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
1	Farm Business Income	---	---	---	---	---
2	Livestock	10027.00 (26.23)	8547.83 (20.75)	----	---	9460.00 (24.32)
3	Nonfarm Enterprise	---	---	---	---	---
4	Agricultural labor	11394.54 (29.80)	14773.91 (35.87)	---	---	12690.00 (32.62)
5	Casual labor	10216.22 (26.72)	13173.91 (31.98)	---	---	11350.00 (29.18)
6	Hiring out agricultural machinery/ Water sale	---	---	---	---	---
7	Rent from leased out land (i) Kind (ii) Cash	---	---	---	---	---
8	Rent from houses (if any)	---	---	---	---	---
9	Interest on deposits or lending to individuals	---	---	---	---	---
10	Salaries	4540.54 (11.88)	3130.43 (7.60)	---	---	3600.00 (9.25)
11	Pensions	---	---	---	---	---
12	Remittances	---	---	---	---	---
13	Income from other sources (specify)	2054.05 (5.37)	1565.21 (3.80)	---	---	1800.00 (4.63)
	Total of all Sources	38232.35 (100.00)	41191.29 (100.00)	---	---	38900.00 (100.00)

Source: Primary Survey

4.7 Indebtedness among Farmers

In this section, efforts have been made to denote farm class and district wise indebtedness among farmers. It comprised the data related to: (a) amount outstanding (at an average), (b) share from institutional sources, (c) share from non-institutional sources, and; (d) share used for productive purposes. Data provide sufficient ground to comprehend that except medium farm households of Ranchi district (100%), surveyed farmers took more loans from non-institutional sources in both the surveyed districts. Majority of the farmers belonging to marginal, small and medium categories availed higher proportions of loan amounts in productive purposes in districts - I & II (93%, 95%, 100% and 96.67% and 98.33%) respectively. On overall level, share of amounts taken as credit and used for productive purposes were 93.65% and 97.50 per cent in districts of Ranchi and Ramgarh respectively.

Average amounts of outstanding for all categories of surveyed farm households were calculated as Rs. 4,938.46 in district – I and Rs. 4,946.67 in district – II. Further, in regard to data of indebtedness of sampled farm households from all categories' calculated for Ranchi and Ramgarh districts, it is found that Rs. 4169.23(84.42%) of total debt and Rs. 3,793.33 (76.69%) were taken from non-institutional sources (table 4.7A & 4.7B). It reveals that in the study area, sample farm households, most of whom belonged to marginal and small farm classes, did have easier access to non-institutional sources of credit.

Table 4.7 (A): Indebtedness among farmers (District – I, Ranchi)

Farm-size categories	Average Amount outstanding (In Rs.)	Share from Institutional Source (%)	Share from Non-Institutional Source	Share used for productive purpose (%)
Marginal farmers	4940.00	750.00 (15.18)	4190.00 (84.82)	4594.00 (93.00)
Small farmers	6150.00	---	6150.00 (100.00)	5842.00 (95.00)
Medium Farmers	2500.00	2500.00 (100.00)	---	2500.00 (100.00)
Large farmers	---	---	---	---
All categories	4938.46	769.23 (15.58)	10340.00 (84.42)	93.65 (10403.79)

Source: Primary Survey

Table 4.7 (B): Indebtedness among farmers (District – II, Ramgarh)

Farm-size categories	Amount outstanding (In Rs.)	Share from Institutional Source (%)	Share from Institutional Source	Share used for productive purpose (%)
Marginal farmers	4955.56	1366.67 (27.58)	3588.89 (72.42)	4790.54 (96.67)
Small farmers	4933.33	833.33 (16.89)	4100.00 (83.11)	4850.94 (98.33)
Medium Farmers	---	---	---	---
Large farmers	---	---	---	---
All categories	4946.67	1153.33 (23.31)	3793.33 (76.69)	9641.48 (97.50)

Source: Primary Survey

4.8 Details of Irrigation Assets

This section puts before data based picture of irrigation related assets owned by the sampled farm households of the districts, their prices, etc. While 12 and 1 farm households in Ranchi district were found to possess diesel and electric pumps respectively, in Ramgarh district, numbers of the two irrigation assets were 12 and 2. Average prices (in Rs./acre) of diesel pump and electric pump in district-I were calculated at Rs. 11,083.33 and Rs. 5,000/- respectively. The same for district-II were calculated as Rs. 11,958.33 and Rs. 7,350/- only respectively (table Nos. 4.8 A & 4.8 B). Availability of tube well/borewell, submersibles and drip irrigation like irrigation assets couldn't be seen in case of any surveyed farm households of the two districts studied.

Table 4.8 (A): Details of irrigation assets (District – I, Ranchi)

Sr. No	Asset	Number of People with Ownership	Average Price	Number of People Renting	Average Rental Rates (Rs./acre)
1.	Tube well/bore well	---	---	---	---
2.	Diesel Pump	12	11083.33	---	---
3	Electric Pump	01	5000.00	---	---
4	Submersibles	---	---	---	---
5	Drip Irrigation	---	---	---	---

Source: Primary Survey

Table 4.8 (B): Details of irrigation assets (District – II, Ramgarh)

Sr. No	Asset	Number of People with Ownership	Average Price	Number of People Renting	Average Rental Rates (Rs./acre)
1.	Tube well/bore well	---	---	---	---
2.	Diesel Pump	12	11958.33	---	---
3	Electric Pump	02	7350.00	---	---
4	Submersibles	---	---	---	---
5	Drip Irrigation	---	---	---	---

Source: Primary Survey

4.9 Information on Land used for Cultivation

This section seeks to capture farm class and district wise information related to land used for cultivation. The description encompasses data and information on : (i) average number of plots, (ii) irrigated area, (iii) number of plots fallow and area under fallow, and; (iv) area under trees. It is to be noted here that no area under trees was visible in regard to land owned by the sampled farm households of both the districts. On all sampled farmers' level, except area under fallow in case of district-II, i.e., Ramgarh (1.95 acre), there was not much difference on the parameters of average number of plots and irrigated area in districts - I & II. These were 1.90, 0.54 acre, 1.85 acres and 0.55 acres) respectively. Having taken aggregated view for both the districts, these were found to be 1.86, 0.55 acre and 1.75 acres respectively. Across the farm size data reveal higher average number of plots in case of small farm households in both the districts 2.1 & 2, larger irrigated areas for higher farm size classes (3.40 acres in medium farms of district - I and 0.85 acre for small farm households in district - II and larger areas under fallow in case of small farms of both the districts (2.44 acres and 2.35 acres) respectively (table 4.9). As district-II didn't have sampled farm households belonging to medium and large categories, so small farm households were ahead in relation to the above described three components.

Table 4.9: Information of land used for cultivation

Districts		Farm-size Categories				
		Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
District I	Average, No. of Plots	1.6	2.1	2.00	---	1.90
	Irrigated Area	0.33	0.75	3.40	---	0.54
	Area under Fallow	1.40	2.44	1.67	---	1.55
	Area under trees.	---	---	---	---	---
District II	Average, No. of Plots	1.7	2.0	---	---	1.85
	Irrigated Area	0.37	0.85	---	---	0.55
	Area under Fallow	1.70	2.35	---	---	1.95
	Area under trees.	---	---	---	---	---
State	Average, No. of Plots	1.71	2.02	2.00	---	1.86
	Irrigated Area	0.35	0.82	3.40	---	0.55
	Area under Fallow	1.53	2.37	1.67	---	1.75
	Area under trees.	---	---	---	---	---

Source: Primary Survey

4.10 Land Holdings of Farmers

This section embraces farm class wise and district-wise information related to land holding of sampled farm households. It contains data on land owned and average size of holdings. No, case of land *leased in and land leased out* was found in either of the districts. One of the reasons for this trend might be the prevalence of CNTA (Chotanagpur Tenancy Act), which scares farmers in leasing out their land.

On the all sampled farmers' level, land owned and average size of holdings in district - I, i.e., Ranchi were estimated at 126 acres and 2.10 acres respectively, whereas in district - II i.e., Ramgarh, these were 150.44 acres and 2.51 acres. The overall sizes were found to be 276.44 acres and 2.30 acres. In both the districts, marginal farm households owned larger total areas followed by small and medium (meant for district-I only). Sizes of land owned (in total) by marginal and small farm households belonging to districts-I & II were 85.30 acres, 25.50 acres & 76.64 acres and 73.80 acres respectively. Having taken both the districts together, land areas owned by marginal, small and medium farm households were found as 161.94 acres, 99.30 acres and 15.20 acres respectively (table 4.10).

Table 4.10: Land holdings of farmers (In acre)

Districts	Particulars	Farm-size Categories				
		Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
District- I	Land Owned	85.30	25.50	15.20	---	126.00
	Land leased in	---	---	---	---	---
	Land Leased out	---	---	---	---	---
	Average Size of Holdings	1.74	3.19	5.07	---	2.10
District- II	Land Owned	76.64	73.80	---	---	150.44
	Land leased in	---	---	---	---	---
	Land Leased out	---	---	---	---	---
	Average Size of Holdings	2.07	3.20	---	---	2.51
State	Land Owned	161.94	99.30	15.20	---	276.44
	Land leased in	---	---	---	---	---
	Land Leased out	---	---	---	---	---
	Average Size of Holdings	1.88	3.20	5.07	---	2.30

Source: Primary Survey

4.11 Land Irrigation and Others

In this section, attempt has been made to analyse and explain farm class wise and district wise land irrigation and other features of sampled farm households. The description focuses on aspects related to (i) total area irrigated, (ii) percentage of irrigated area, (iii) area under food grains, and; (iv) area under fruits and vegetables. Having analysed on all sampled farmers' level, it is observed that percentages of irrigated area were 100 in the two districts and at overall level. Total irrigated areas in districts I & II and at overall level, were estimated at 32.65 acres, 33.22 acres and 65.87 acres respectively. Much larger proportions of land were found to have been occupied by food grains in the two surveyed districts (97.37% and 95.83%) respectively. Across the farm size, larger percentages of irrigated areas were viewed in cases of marginal farm households of district-I and at overall level, but in regard to small farms of district-II (50.38, 45.65 and 59.00) respectively. Very small areas under fruits and vegetables were found to have been devoted by marginal, small and medium farm households of both the districts (2.70%, 3.41%, 0.99% meant for district - I and 4.02% & 4.32% in district-II) respectively. At overall level, marginal, small and medium farm households devoted 96.73 per cent, 95.91 per cent and 99.01 per cent areas under food grains and remaining meagre proportions of land to fruits and vegetables (table 4.11).

Table 4.11: Land Irrigation and others

Districts	Particulars	Farm-size Categories				
		Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	All Sampled Farmers
District I	Total irrigated Area (Acre)	16.45	6.00	10.20	---	32.65
	% of irrigated Area	50.38	18.38	31.24	---	100.00
	Area under food grains	83.00 (97.30)	24.63 (96.59)	15.05 (99.01)	---	122.68 (97.37)
	Area under fruits and vegetables	2.30 (2.70)	0.87 (3.41)	0.15 (0.99)	---	3.32 (2.63)
District II	Total irrigated Area (Acre)	13.62	19.60	---	---	33.22
	% of irrigated Area	41.00	59.00	---	---	100.00
	Area under food grains	73.56 (95.98)	70.61 (95.68)	---	---	144.17 (95.83)
	Area under fruits and vegetables	3.08 (4.02)	3.19 (4.32)	---	---	6.27 (4.17)
State	Total irrigated Area (Acre)	30.07	25.60	10.20	---	65.87
	% of irrigated Area	45.65	38.86	15.49	---	100.00
	Area under food grains	156.65 (96.73)	95.24 (95.91)	15.05 (99.01)	---	266.94 (96.56)
	Area under fruits and vegetables	5.38 (3.27)	4.06 (4.09)	0.15 (0.99)	---	9.59 (3.44)

Source: Primary Survey

Note: Figures in parentheses show percentages of respective total.

4.12 The Extent of Fallow Land

Efforts have been made to make out in this section about block wise extent of fallow land in the surveyed districts. Exercises have been made to find out the

data/aspects related to (i) area of fallow land, (ii) percentage of total land, (iii) number of households owning wells, (iv) number of wells, (v) area irrigated per well (vi) average number of well per household, and; (vii) average number of tractors. A glance on data helps to comprehend that surveyed farm households of Namkum block under Ranchi district had highest percentage to total land (80.66) closely followed by Gola and Patratu blocks of Ramgarh district (79.67% & 76.69%) respectively. Area irrigated per well was found to be the largest in Patratu block (1.39 acres). Average number of tractor was also found to be maximum again in Patratu block (0.07) equally followed by the remaining three blocks, i.e., Kanke, Namkum and Gola (0.03). Areas of fallow lands owned by the surveyed farm households of Kanke, Namkum, Gola and Patratu blocks were estimated at 49.50 acres, 43.58 acres, 49.45 acres and 67.77 acres respectively (table 4.12). It is to be noted here that none of the sampled farm households did possess any un-culturable land area.

Table 4.12: The extent of Fallow land (Area in Acre)

Districts/Blocks	Total owned Land	Fallow Land	Percentage of Fallow Land to Total land	No of households owning wells	No. of wells	Area irrigated per well	Average no of well per household	Average of tractor
Ranchi Block I (Kanke)	71.70	49.50	69.04	---	---	---	---	0.03
Block II (Namkum)	54.03	43.58	80.66	---	---	---	---	0.03
Ramgarh Block III (Gola)	62.07	49.45	79.67	1	1	0.78	0.03	0.03
Block IV (Patratu)	88.37	67.77	76.69	2	2	1.39	0.07	0.07

Source: Primary Survey

4.13 Fallow Land of Households

In this section, efforts have been made to calculate and mention data based facts to support farm class wise and district wise description regarding fallow land of households (Hhs). It discusses: (i) number, (ii) total owned land, (iii) fallow land related area, average area and percentage of total owned land. The data provide sufficient ground to impart obtained facts that at overall level (taking all categories together), percentage of fallow land to total owned land was 74.09 in district - I, i.e., Ranchi and 77.89 in district-II, i.e., Ramgarh. Across the farm size, marginal farm

households owned highest proportions of fallow to total owned land in both the districts (80.71% & 82.19%) in districts – I & II respectively. While marginal sampled farm households in both the districts owned larger areas (85.3 acres and 76.46 acres) largest total fallow lands were also reported in case of marginal households itself (68.85 acres and 62.84 acres) respectively. Percentage of fallow land to total owned land by medium farm households of Ranchi district was 32.89 as sample households of Ramgarh did not have medium and large categories of farm households. In regard to average area of fallow land, small farm households of both the districts were ahead (2.44 acres and 2.36 acres) respectively. At overall level, these were 1.56 acres and 1.95 acres for districts – I & II respectively (table 4.13).

Table 4.13: Fallow land of households (Area in Acre)

Farm-size categories	District I					District II				
	No. farms	Total owned land	Fallow land			No. farms	Total owned land	Fallow land		
			Area	Average Area	% of total owned land			Area	Average Area	% of total owned land
Marginal farmers	49	85.3	68.85	1.40	80.71	37	76.46	62.84	1.70	82.19
Small farmers	8	25.5	19.5	2.44	76.47	23	73.80	54.2	2.36	73.44
Medium Farmers	3	15.2	5.00	1.67	32.89	---	0.00	0.00	0.00	0.00
Large farmers	---	---	---	---	---	---	---	---	---	---
All categories	60	126.00	93.35	1.56	74.09	60	150.26	117.04	1.95	77.89

Source: Primary Survey

4.14 Extent of Fallow Land Social Category-wise

In this section of the Chapter, attempt has been made to analyse and describe social category wise and district wise extent of fallow land. The components discussed in the preceding section have been analysed in regard to: (a) other backward class (OBC), (b) Scheduled Tribe (ST), (c) Scheduled Caste (SC), and; (d) All Categories (district wise). No sampled farm households belonged to general category in both the districts. District-I did not have other backward class (OBC). No surveyed farm households belonged to SC also in either of the districts. Percentages of fallow land out of total owned land by the ST households in districts-I &II were 74.09 and 77.54

respectively. On overall level, these were found as 74.09 and 77.89 respectively. In regard to district - II, OBC farm Households possessed 16.15 acres of fallow land, average size of fallow land was estimated at 1.79 acres and percentage of fallow land to total owned land was 81.15. Areas of fallow land owned by all categories of farm households in districts I&II were estimated at 93.35 acres and 117.04 acres, averages of fallow land being 1.54 acres and 1.95 acres respectively (table 4.14).

Table 4.14: Extent of Fallow Land by Social Category (Area in Acre)

Categories	District I					District II				
	No. farms	Total owned land	Fallow land			No. farms	Total owned land	Fallow land		
			Area	Average Area	% of total owned land			Area	Average Area	% of total owned land
General	---	---	---	---	---	---	---	---	---	---
Other Backward Castes	---	---	---	---	---	9	20.15	16.15	1.79	81.15
Scheduled Tribes	60	126.00	93.35	1.56	74.09	51	130.11	100.89	1.98	77.54
Scheduled Castes	---	---	---	---	---	---	---	---	---	---
All categories	60	126.00	93.35	1.54	74.09	60	150.26	117.04	1.95	77.89

Source: Primary Survey

4.15 Social Farm Class wise Fallow Land Scenario

In this section of the Chapter, attempt has been made to illuminate on extents of fallow land left fallow by surveyed farmers belonging to different social groups and land holding classes in both the districts. The extents have been analysed in terms of percentages of fallow lands to 'total owned land' by respective categories/groups of farm households. Total land areas owned by ST category of farmers in district -I, i.e., Ranchi was 100 and 86.20 per cent of the respondents belonging to same social group in district-II, i.e., Ramgarh were left fallow. In district-I, 73.75 per cent and 20.89 per cent of land areas were found fallow in case of marginal and small farm households, whereas in district - II, the same were 53.69 per cent and 46.31 per cent respectively. Areas under main crop, i.e., paddy were very high in district-I & II (76.15% & 72.06%) respectively, the production potential of which was limited by significantly larger unirrigated areas (74.09% and 77.92%) respectively.

These extents of land areas left fallow by different social and farm size groups of surveyed households are percentages of fallow land to 'total fallow land area' by all farm size groups of farmers surveyed in the particular district. Irrigated areas in both the districts were quite insufficient (25.91% and 22.08%) respectively. Overall percentage of irrigated land area (having taken both the districts together) was found at 23.83 (table 4.15).

On overall level (i.e., taking both the districts together), OBC households were found to have owned maximum percentage of fallow land (92.32). In regard to farm size wise criteria and irrigation front, larger concentrations of fallow land were viewed in case of marginal households (62.59%) and unirrigated area (76.17%) respectively.

Table No. 4.15: Fallow Land (%) of households in different Social and Farm Size Categories

Indicators	District- I	District-2	Overall
Social Group(%of Fallow land)			
SC	-	-	-
ST	100.00	86.20	07.68
OBC	-	13.80	92.32
General	-	-	-
All	100.00	100.00	100.00
Farm size wise			
Marginal	73.75	53.69	62.59
Small	20.89	46.31	35.03
Medium	05.36	-	02.38
Large	-	-	-
All	100.00	100.00	100.00
Irrigation			
Irrigated	25.91	22.08	23.83
Un irrigated*	74.09	77.92	76.17
Main crop (Paddy)	76.15	72.06	73.92

Source: Primary Survey

* % of Unirrigated displays the land area left fallow

4.16 Major Kharif Crops Preceded by Rabi Fallow

In this section of the chapter, attempt has been made to look carefully into the detail of major kharif crops preceded by rabi fallow. It is to be urgently denoted here that in Jharkhand, particularly in the two surveyed districts, i.e., Ranchi and Ramgarh, entire cultivable land areas remain fallow after the harvesting of paddy, i.e., from mid December to the next year's May/June, i.e., till the spreading of paddy seed. Meaning there to write that major portion of land is left fallow for complete six to seven months. It is brought to view that paddy was the major kharif crop grown in

kharif season in both the districts (95.95 acres and 108.4 acres) in districts - I & II respectively. Larger proportions of total rabi fallow were seen in case of paddy followed by maize and Arhar in districts - I & II (102.79%, 92.62%, 18.01% 21.06%, 10.63% and 9.50%) respectively. At all kharif crop level, areas under kharif crops in districts - I & II were 97.37 per cent and 95.95 per cent respectively. At overall level, total areas under Rabi fallows in the two districts were 122.68 acres and 144.17 acres. Average areas of rabi fallow were calculated as 1.02 acres and 1.20 acres respectively. Percentages of area of kharif crop that remained fallow during rabi season in regard to crops, namely: paddy, arhar and maize in districts-I & II were found at (76.15, 07.87, 13.34 and 72.14, 7.40 & 16.40) respectively (table 4.16). It is to be mentioned here that arhar and maize occupied very little proportions of cultivable area even during kharif season.

Table 4.16: Major Kharif Crops Preceded by Rabi Fallow (Area in Acre)

District I						District II					
	Crop (kharif)	Fallow (Rabi)					Crop (kharif)	Fallow (Rabi)			
S.N	Name of the Crops	Total Area	Average	% of total Rabi fallow	% of Kharif Crop	S.N	Name of the Crops	Total Area	Average	% of total Rabi fallow	% of Kharif Crop
1	Paddy	95.95	0.80	102.79	76.15	1	Paddy	108.4	0.90	92.62	72.14
2	Arhar	9.92	0.08	10.63	7.87	2	Arhar	11.12	0.09	9.50	7.40
3	Maize	16.81	0.14	18.01	13.34	3	Maize	24.65	0.20	21.06	16.40
4	All Kharif	122.68	1.02	131.42	97.37	4	All Kharif	144.17	1.20	123.18	95.95

Source: Primary Survey

4.17 Major Rabi Crops Preceded by Kharif Fallow

It is a fact to be unfolded here that no surveyed farm households were found to have left land fallow during kharif season. Further, no rabi crop was found to have been grown before the kharif crops, as well as, in the case of sampled farm households, so this section did not need an analysis.

4.18 Previous Crops Grown before Fallow

Having cogitated on previous crops grown before fallow land, it is revealed that greater proportion of land areas were allocated to paddy crop only by marginal, small and medium farm households (125.05 acres, 68.15 acres and 11.15 acres) respectively. Marginal, small and medium farm households allocated 12.45 acres, 7.49) acres and 1.1 acres of owned areas to pulse also before leaving land fallow. Among previous crops grown before fallow land, maize also got 19.06 acres, 19.60 acres and 2.8 acres by marginal, small and medium sampled farm households respectively (*Figure-I in Appendix in- V*).

4.19 Desired Facilities for Returning to Farming

Analysis of data helps us to find out that sampled farm households will return to farming, if they are provided with assured irrigation facility, timely availability of credit, insurance and improved output markets (100%, 100%, 98.83% and 58.33%) respectively. It is also to be elicited here that other conditions also matter (to some extent for promoting farmers return to growing crops in fallow land. These may be noted as extension services (30.83%), improved storage facilities are ensured (27.5%) and fair and assured procurement practices are made effective (39.17%) (*Figure-II in Appendix- VI*).

4.20 Reasons for Land Left Fallow

In this section of the Chapter, attempt has been made to consciously find out the reasons or factors responsible for leaving land fallow by surveyed farmers. A well-determined and given list of reasons' for leaving land fallow in the study area has been enumerated and analysed by using: (i) average rating, and; (ii) standard deviation (SD) of the ratings. Prudent analysis suggests that lack of assured irrigation was rated as one of the most prominent reasons for leaving land fallow with average rating of 4.46 and standard deviation (SD) of 55. The next important reasons were lack of watershed or similar efforts, which could recharge ground water (1.98) with SD of 44, surface runoff (1.96) with SD 42, no access to easy credit (1.92) with SD 30 and moved to other occupations (particularly during the rabi season), which were more profitable (1.90) with SD 61.00. Apart from the above

described reasons, some other factors responsible for leaving land fallow were: land is not suitable for cultivation (1.81) with SD-48, land set apart for conversion into non-agricultural purposes (1.80) with SD 63 and close to mountain/ forest (1.79) with SD 42 (table 4.17). Uncertainty of rainfall can also not be underestimated and ignored (1.51) with SD 75.00 as one of the stronger reasons.

It is to be noted here that the reasons for leaving land fallow have been measured on scale of 1 to 5 with **1 being not at all a reason to 5 being one of the major reasons**. All the 26 listed reasons captured through the questionnaire have been rated on this scale.

Table 4.17: Reasons for Land Left Fallow

SN	Regions for Leaving Land Fallow	Average rating	Standard Deviation of the Ratings
a.	Land is not suitable for cultivation	1.81	48.00
b.	Land set apart for conversion into non-agricultural purposes	1.80	63.00
c.	Not able to recover costs in farming/ Low profit	1.48	77.00
d.	Lack of assured irrigation	4.46	55.00
e.	Moved into other occupations which are more profitable	1.90	61.00
f.	Providing grazing lands for the cattle	1.70	60.00
g.	To Conserve moisture & prepared land for next crops	1.77	53.00
h.	Labor is not available for cultivation	1.73	49.00
i.	High yield volatility in the previous years	1.68	61.00
j.	Lack of assured market for the produce	1.73	49.00
k.	High price volatility in the previous years	1.62	65.00
l.	High production cost/lack of resources	1.78	56.00
m.	Lack of agricultural extension	1.20	64.00
n.	No access to credit	1.92	30.00
o.	Surface runoff	1.96	42.00
p.	Lack of watershed or similar efforts which could recharge ground water	1.98	44.00
q.	Water logging	1.55	68.00
r.	Uncertainty in rainfall	1.51	75.00
s.	Issues related to land entitlement	1.21	46.00
t.	Lack of expertise/experience in cultivation	1.42	71.00
u.	Shocks in personal life (like accident or death of a member)	1.43	75.00
v.	Low fertility of Soil & lack of Interest in cultivate in unfavorable season	1.56	57.00
w.	Lack of plough/tractor/Farm Yard Manure (FYM)	1.30	69.00
x.	Weed infected	1.45	44.00
y.	Close to mountain/forest	1.79	42.00
z.	Left land fallow for crop rotation	1.25	54.00

Source: Primary Survey

CHAPTER – V

CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

It is depressing and anxiety creating that there was an increase of 43.07 per cent in current fallows in India during the more than six decades' period of 1950-51 to 2012-13. So, this threat of increase in area of current fallow lands in India needs to be effectively checked and suitably tackled by adopting 'observation based' region specific measures.

With the adoption of the nine fold classification since 1950-51, an element of non-comparability has been pushed in the data before and after that year. For instance, in the old land utilization classification, the term current fallows included the land lying fallow even up to a period of 10 years in the former Bombay State, and for 02 (two) years in the former Punjab State, whereas in the revised nine fold classification, the current fallows have been limited to the lands lying fallow for one year only, and the term other fallow land includes land lying fallow for more than one year, but less than five (05) years. Thus, the areas under current fallows in the old fivefold classification need not necessarily add up to two sub-classes in the new classification, i.e., current fallows and other fallow land. Some of the lands lying fallow beyond five years may have been included in the nine fold classification as culturable waste.

The PCI of Jharkhand is not only much less than the all-India average, but is lesser than most of the states of the country. It is higher than only five states of the nation, namely; Bihar, UP, MP, Manipur and Assam. However, its growth rate is not only higher than the all-India average, it is lower, or behind the growth rates of only three states of India, namely; Gujarat, Mizoram and Tripura. The performance of Jharkhand in the last five years, i.e., during 2011-12 to 2015-16, has been better than the performance of the country as a whole. While the GDP of India grew at an

average annual rate of 6.8 per cent (CAGR), the GSDP of the state grew at the average rate of 8.80 per cent per annum during the period. It is vouch safe to suggest that all possible measures should be taken up for expanding irrigation facilities, enhancing yield of cereals, (paddy, wheat) and coarse cereals, and to effectively check the increasing threat of fallow land in Jharkhand.

The state of Jharkhand has nearly 34.70 per cent of the area under total fallow out of its total geographical area of 79.70 lakh ha. It is a matter to be worried that a high proportion of land is under fallow (current fallow and fallow other than current fallow). It means that the improvements made in wasteland reclamation and efforts for bringing these lands into cultivation, is partly negated. It is, therefore, desirable to augur the dynamics of fallow land and suitable and possible measures to be taken up for its revival. In this light, the study has its own discreet and high relevance.

5.2 Objectives

The study encircles following objectives:

- vi. To discuss the trends related to area under fallow land (current and permanent) in Jharkhand.*
- vii. To find out reasons for which farmers are leaving the land fallow.*
- viii. To comprehend the low cost, or no cost measures to reduce area under fallow land.*
- ix. To assert the crops suited for cultivation in fallow/fragile land, and;*
- x. To suggest observation based action points.*

5.3 Chapter Scheme

All the objectives of the study have been addressed by encompassing the following chapters:

Chapter - I	:	Introduction
Chapter - II	:	Methodology, Concepts and Definitions
Chapter - III	:	Extent of Fallow Land in State
Chapter - IV	:	Results of Primary Survey
Chapter - V	:	Conclusion ad Policy Implications

5.4 Methodology, Concepts and Definitions

The point of anxiety is that a little less than the percentage of NAS is the magnitude of current fallow (21.76%), i.e, 1,08,217 ha. No doubt, NSA of Ranchi district in percentage terms is more than the state's scenario (17.37%), however, on the fronts of fallow lands other than current fallow, and current fallow, the district faces an alarming situation as compared to the states figures (15.75%, 21.76%, 14.07% & 17.38%) respectively. More than 60 per cent of the population is rural based and their livelihood depends solely on agriculture and allied activities. About 82 per cent of the households have holdings of less than 2 hectares with the average holding size being 1.18 hectare. Only 0.84 per cent of the households have land holdings greater than 10 hectares. NAS in Ramgarh district is very low estimated at 7,779 ha (5.56%) against state's figure of 17.37 per cent. Area under current fallow is 30,166 ha (21.55%) almost similar to Ranchi district in percentage terms, but well above the state's figure (17.38). Scheduled Caste comprised 11.20 per cent of the total population, whereas ST were 21.19 ;per cent showing that like Ranchi district, Ramgarh district is also tribal dominated. *At the first stage of sampling*, the total fallow land as a percentage of total land reported was kept at least 2.00 per cent. Further, *at the second stage*, from out of those districts, which came under the criteria, the districts with highest fallow land and lowest fallow land were selected. *At the third stage of sampling*, as per the suggested methodology, Ranchi district (from out of the districts with highest fallow land 1,70,709 hectares) and Ramgarh district with 47,577 ha of total fallow land (from out of the class of districts with lowest fallow land) were selected for in depth study. *At the fourth stage of sampling*, in each of the districts selected, two blocks have been selected based on the average of fallow land (for the recent year, for which the data was available). The two blocks with highest fallow land have been selected. Having followed this criterion, Kanke and Namkum blocks under Ranchi district and Gola and Patratu blocks under Ramgarh district, have been selected. *At the fifth stage of sampling*, from each of the selected blocks, two villages/village clusters have been randomly selected. The villages selected in Ranchi district are: (i) Pattagain and (ii) Chama-Barhu (under Kanke block) and (i) Garke and (ii) Plandu (in Namkum block). Villages selected for detail study in

Ramgarh district are: (i) Rola and (ii) Baman Sangatu (under Gola block) and (i) Armadag and (ii) Jumra (under Patratu block).

For the state of Jharkhand only, the criteria of minimum of 10 hectares of current fallow land and 15 farm households, who have left land current fallow, were suggested. *At the sixth stage of sampling*, from each of the villages/village clusters, 15 farmers, who had left the land fallow over a year/current fallow, have been surveyed. Thus, the total sample was $(2 \text{ villages} \times 2 \text{ blocks} \times 15 \text{ Hhs} \times 2 \text{ districts} = 120)$.

5.5 Extent of Fallow Land in State

It is interesting to note that during the 14 years' period of 2001-02 to 2014-15, the state of Jharkhand witnessed an increase of 2,11,427 ha in its area under fallow lands other than current fallows. It is stimulating to note here that 11.20 per cent of the total reported area was under fallow lands other than current fallow and 18.18 per cent were under current fallows categories in the year 2001-02. Both the types of fallows comprised **29.60 per cent** of the total reported area. In the year 2014-15, areas under the two types of fallows were 14.07 per cent and 17.38 per cent respectively. Both the categories of fallow land taken together accounted for **31.45 per cent** of the total reported area. CAGR of fallow lands other than current fallow remained at 1.43 per cent during the later period; though it was 0.11 per cent lower than the previous duration's CAGR 1.54 per cent. Having a glance on the data of CAGR calculated for the two periods i.e., 2000-10 and 2010-16 in regard to different land use categories in Jharkhand, it is evident that area under non-agricultural uses showed a decline of 1.57 per cent in the later period. There was a fall of 0.02 per cent in barren and unculturable land during the later period (2010-16). It is interesting to note that during the former period, i.e., 2000-10, there was a decline of 2.16 per cent in net area sown (NAS), which went up to 4.99 per cent during the later period. Having shown an increase of 0.85 per cent during the former period, CAGR of current fallows revealed a decline of 4.33 per cent during the later period.

Except Hazaribagh and Ranchi districts, there was no change in CAGR of reported area for land utilization. The CAGR calculated for the period 2001-02 to 2014-15 meant for these districts declined by 13.11 per cent and 19.02 per cent respectively.

Areas under forests in the two districts also fell by 9.00 per cent and 17.16 per cent respectively. Area under non-agricultural use indicated falls in 16 districts, which varied from 0.11 per cent to 30.22 per cent. CAGRs of only six districts showed positive change in regard to net area sown (NAS). These districts were: Garhwa, Jamtara, Kodarma, Palamu, Sahibganj and Saraikela Kharsawan (1.52%, 6.29%, 4.05%, 4.68%, 11.16%, and; 13.25%) respectively. 50.00 per cent of the total districts, i.e., 12 witnessed increases in CAGR on the LUC of *culturable waste land*. Its percentages varied from 0.10 in case of Godda to 59.09 for Latehar district. On the LUC of *fallow land other than current fallow*, most of the districts, i.e., 17 out of 24, revealed increases in CAGR. The percentages of CAGR varied from 1.42 in case of Hazaribagh to 82.25 in case of Jamtara. In regard to *current fallows* also, a little less than 50 per cent of the total districts, i.e., 11 out of 24, showed positive CAGR. The increases in *areas of current fallows* varied from 1.09 per cent in case of Khunti to 34.15 per cent in East Singhbhum district. In regard to *current fallows*, during the TE 2001-02 to 2003-04 and 2012-13 to 2014-15 --- Bokaro, Dhanbad, Garhwa, Gumla, Hazaribagh, Jamtara, Latehar, Lohardagga, Palamau, Ranchi, Sahibganj, Simdega and West Singhbhum revealed declines. Geographical area of Jharkhand was 7,970.075 thousand hectares in the year 2000, *when it came into existence*. It remained the same in the year 2010-11. The area of Ranchi district was 758.394 thousand ha in the year 2001-02, which declined to 497.306 thousand hectare in 2010-11. The reason for this reduction in area of Ranchi district may be as a result of creation of Ramgarh district in the year 2006-07. Geographical area of Ramgarh district in the above noted two periods was 139.998 thousand hectares Data in the table embodies the fact that both the districts moved towards urbanizations during the period 2001-02 to 2010-11.

Data endorse encouraging declines in areas under current fallows in 15 out of total 24 districts over the period. Jamtara, East Singhbhum and Hazaribagh districts showed highest declines/falls in areas under current fallows (5.79%, 4.30% and 3.27%) respectively. On the overall level, during the period, decline in current fallows was quite high at 13.09 per cent. Ranchi, Koderma, Hazaribagh and Godda

were the major districts that needed special attention in regard to larger declines in NAS (3.82%, 3.73%, 2.95% and 1.87%) respectively. Taking the case of state as a whole, the decline in fallow land other than current fallows was found at 10.42%. 13 districts of the state indicated declines in areas under non-agricultural uses. Hazaribagh, Koderma and Ranchi (4.80%, 4.70% and 3.05%) respectively were prominent among them. So, there is need to make special efforts for checking the alarming declines in areas under non-agricultural uses.

It can be expounded that Ranchi district had much higher NAS in the year 2014-15 (23.44%) as compared to Ramgarh district and the state of Jharkhand as a whole (5.56% and 17.35%) respectively. Cropping Intensity (CI) of Ranchi district was higher (129.97%) than Ramgarh district and state average in the year 2001-02. But, in 2014-15, CI of Ramgarh (201.85%) was more than Ranchi district and state average (104.06% and 112.22%) respectively. It can be contended that highest percentages of NAI in the state of Jharkhand during the years 2000-01, 2005-06 and 2010-11 were from canals and tanks (43.97, 44.34, 32.00, and; 31.20, 31.13, 22.40) respectively. Next important sources of irrigation were canals and tanks, others and tube wells. Percentage of potential created (PC) to ultimate potential (UP) was nearly 2.78 times more in case of major and medium irrigation schemes than that of minor irrigation (39.74 and 14.29) respectively. Similarly, percentage of potential utilized (PU) to PC was quite higher in regard to major and medium irrigations as compared to minor irrigation schemes (60.03 and 48.99) respectively. On overall level meant for the state of Jharkhand, these were 27.50 per cent and 57.28 per cent respectively.

As far annual rainfall in Jharkhand is concerned, except significant variations i.e., declines during the years 2005-06, 2009-10 and 2010-11, it has remained more or less similar during the 16 years' long period of 2001-02 to 2016-17. Numbers of drought affected districts in the state were as high as 24,24,22,22,20 and 15 in the years 2009-10, 2010-11, 2005-06, 2015-16, 2004-05 and 2003-04 respectively. It is to be noted here that total number of districts in Jharkhand is 24.

5.6 Results of Primary Survey

On overall level, the three farm size classes had total population of 715, 260 and 28 respectively. In Ramgarh district, no sample farm household belonged to medium or large categories. Sex ratio (per female) was found maximum in marginal farm households for Ranchi district (1.31), small farm households both in case of Ramgarh district and at overall level (1.38 and 1.34) respectively. It is seen that in both the districts I & II, i.e., Ranchi and Ramgarh and at state level, means both surveyed districts taken together, number of households' family members in the age bracket up to 14 years were highest 219, 211 and 430 respectively. Across the farm size categories, the picture emerged, displays that maximum households' family members belonged to the age bracket of up to 14 years followed by 15 to 59 years and 60 years & more age brackets, meant for both the districts and at overall level. Concludingly, it can be noted that surveyed households of the selected districts were dominated by young population, i.e., up to 14 years of age.

Enthusiastic picture is enunciated in regard to education level. In regard to data of all sampled farmers, highest number of members of households surveyed had education level of graduate and above meant for Ranchi Ramgarh and overall levels (17, 17 & 34) respectively. Numbers of illiterate/below primary level members of surveyed households were the minimum in all the three cases. Having taken both the districts together, the average size of operational holdings of surveyed marginal, small, medium and all sampled farmers were counted as: 1.88 acres, 3.20 acres, 5.06 acres and 2.30 acres respectively. Across the districts, Ramgarh (district-II) did show a little bigger size of average operational holding than that of district - I (2.50 acres and 2.10 acres) respectively.

It is found that on all sampled farmers level for the two districts, the average family size of surveyed farm households was 8.36. District-I (Ranchi) had a bit larger family size (8.45) than district-II, Ramgarh (8.27). Across the farm size categories data indicates that among the marginal farm households, family size of district-II was a little bigger than that of district-I (8.32 & 8.31) respectively. The fact that agricultural labour contributed highest share on all sampled farmers' level in the

composition of total income in district-I, i.e., Ranchi (Rs. 12,223=33) could be countenanced. The lowest share was from salaries (Rs. 4,166.67). Across farm size analysis shows that medium farm households earned highest income from livestock, small farmers by working as agricultural labourer (Rs. 15,975/-) and again medium farms earned as casual labour (Rs. 15,000/-) only. In percentage terms also, income from agricultural labour was the major contributor (31.10%) followed by casual labour and livestock (27.98% and 25.59%) respectively. In regard to district-II, i.e., Ramgarh, there is sufficient ground to mean that on all sampled farmers' level, agricultural labour and income earned through it, was the most significant contributor in composition of total income (Rs. 12,690/-) i.e., 32.62 per cent of the total from all sources. Across farm size analysis also reveals *the source of agricultural labour* as the most important for both marginal and small farm households (29.80% and 35.87%) respectively. Data confirmed that except medium farm households of Ranchi district (100%), surveyed farmers took more loans from *non-institutional sources* in both the surveyed districts. Majority of the farmers belonging to marginal, small and medium categories availed higher proportions of loan amounts *in productive purposes in districts - I & II* (93%, 95%, 100% and 96.67% and 98.33%) respectively. It reveals that in the study area, *sample farm households*, most of whom belonged to marginal and small farm classes, *did have easier access to non-institutional sources of credit*. While 12 and 1 farm households in Ranchi district were found to possess diesel and electric pumps respectively, in Ramgarh district, numbers of the two irrigation assets were 12 and 2. On all sampled farmers' level, except area under fallow in case of district-II, i.e., Ramgarh (1.95 acre), there was not much difference on the parameters of average number of plots and irrigated areas in districts - I & II. These were 1.90, 0.54 acre, 1.85 acres and 0.55 acres) respectively. Across the farm size data reveal higher average number of plots in case of small farm households in both the districts 2.1 & 2, larger irrigated areas for higher farm size classes (3.40 acres in medium farms of district - I and 0.85 acre for small farm households in district - II. Larger areas under fallow in case of small farms of both the districts (2.44 acres and 2.35 acres) respectively were viewed.

On the all sampled farmers' level, land owned and average size of holdings in district - I, i.e., Ranchi were estimated at 126 acres and 2.10 acres respectively, whereas in district - II i.e., Ramgarh, these were 150.44 acres and 2.51 acres. The overall sizes were found to be 276.44 acres and 2.30 acres. In both the districts, marginal farm households owned larger total areas. In district - I, it was followed by medium farm Hhs. On all sampled farmers' level, it is observed that percentages of irrigated area were 100 in the two districts and at overall level. Total irrigated areas in districts I & II and at overall level, were estimated at 32.65 acres, 33.22 acres and 65.87 acres respectively. Much larger proportions of land were found to have been occupied by food grains in the two surveyed districts (97.37% and 95.83%) respectively. Across the farm size, larger percentages of irrigated areas were viewed in cases of marginal farm households of district - I and at overall level (50.38 & 45.65), but in regard to small farms of district-II, it was 59.

Areas of fallow lands owned by the surveyed farm households of Kanke, Namkum, Gola and Patrattu blocks were estimated at 49.50 acres, 43.58 acres, 49.45 acres and 67.77 acres respectively. There is ground to deem that surveyed farm households of Namkum block under Ranchi district had highest percentage of fallow land to total land (80.66) closely followed by Gola and Patrattu blocks of Ramgarh district (79.67% & 76.69%) respectively. It can be intoned that at overall level (taking all categories together), *percentage of fallow land to total owned land was 74.09 in district - I, i.e., Ranchi and 77.89 in district-II, i.e., Ramgarh.* Across the farm size, marginal farm households owned highest proportions of fallow to total owned land in both the districts (80.71% & 82.19%) in districts - I & II respectively.

Percentage of fallow land to total owned land by medium farm households of Ranchi district was 32.89 as sample households of Ramgarh did not have medium and large categories of farm households. In regard to average area of fallow land, small farm households of both the districts were ahead (2.44 acres and 2.36 acres) respectively. Areas of fallow land owned by all categories of farm households in districts I&II were estimated at 93.35 acres and 117.04 acres, averages of fallow land being 1.54 acres and 1.95 acres respectively. No sampled farm households belonged to general

category in both the districts. District-I did not have other backward class (OBC). No surveyed farm households belonged to SC also in either of the districts. Percentages of fallow land out of total owned land by the ST households in districts-I & II were 74.09 and 77.54 respectively. On overall level, these were found as 74.09 and 77.89 respectively. In district-I, 73.75 per cent and 20.89 per cent of land areas were found fallow in case of marginal and small farm households, whereas in district - II, the same were 53.69 per cent and 46.31 per cent respectively. Areas under main crop, i.e., paddy were very high in district-I & II (76.15% & 72.06%) respectively, the production potential of which was limited by significantly larger unirrigated areas (74.09% and 77.92%) respectively. On overall level (i.e., taking both the districts together), OBC households were found to have owned maximum percentage of fallow land (92.32). In regard to farm size wise criteria and irrigation front, larger concentrations of fallow land were viewed in case of marginal households (62.59%) and unirrigated area (76.17%) respectively. Average areas of rabi fallow were calculated as 1.02 acres and 1.20 acres respectively. It is brought to view that paddy was the major kharif crop grown in kharif season (95.95 acres and 108.4 acres) in districts - I & II respectively. Larger proportions of total rabi fallow were seen in case of paddy followed by maize and Arhar in districts - I & II (102.79%, 92.62%, 18.01% 21.06%, 10.63% and 9.50%) respectively. At all kharif crop level, areas in districts - I & II were 97.37 per cent and 95.95 per cent respectively. Having essayed data related to on previous crops grown before fallow land, it is revealed that greater proportion of land areas were allocated to paddy crop only by marginal, small and medium farm households (125.05 acres, 68.15 acres and 11.15 acres) respectively. Sampled farm households will return to farming, if they are provided with *assured irrigation facility, timely availability of credit, insurance and improved output markets* (100%, 100%, 98.83% and 58.33%) respectively. Prudent analysis suggests that lack of assured irrigation was rated as one of the most prominent reasons for leaving land fallow with average rating of 4.46 and standard deviation (SD) of 55. The next important reasons were lack of watershed or similar efforts, which could recharge ground water (1.98) with SD of 44, surface runoff (1.96) with SD 42, no access to easy

credit (1.92) with SD 30 and moved to other occupations (particularly during the rabi season), which were more profitable (1.90) with SD 61.00.

5.7 Policy Prescriptions

Based on the analysis of preceding chapters and observation based ground realities during survey, following discreet measures have been suggested for countering the menace of increasing fallow land in Jharkhand:

- i. Irrigation facility needs to be expanded by way of making existing structures of irrigation functional and expediting “**Prime Minister Krishi Sinchai Yojana (PMKSY, 2015)** in a time bound manner.
- ii. Since Jharkhand has undulated topography, so there is need to check the run-off of water by emphasizing on watershed development structures with active participation of the farmers of respective command areas of watershed schemes.
- iii. Sensitization of **formal credit institutions** is the need of the hour along with the tracking of applications to make available required agricultural credit in time. Relaxation may be provided to farmers by reducing procedural complexities. Disposal of such applications may be made in **targeted form and camp mode**.
- iv. With the view to remove the threat of open grazing, particularly during post-kharif season, ‘**Kanji Houses**’ for stray animals may be formed under the control of local bodies.
- v. Quite oftenly fallow lands are the results of land degradation, which may be checked by providing soil test facility in close vicinity of the farms.
- vi. To promote cultivation in fallow lands, some specific crops i.e., pulses like arhar, kulthi and millets (*comprising bajra, sanwa, madua, jowar, kodo, gondli, etc.*) suited to the respective agro-climatic regions may be grown. It will be in tune with the proposal of the Hon’ble Union Minister of Agriculture & Farmers Welfare, Government of India, to the United Nations for declaring the year 2018 as ‘International Year for Millets). This may be made possible by giving farmers Kit **support through the Government**.

- vii. Contract farming for such lands may be helpful in reducing the extent of fallow land.
- viii. A **DPR may be formulated for revival of permanent fallows and unculturable wastelands** and its implementation may be made in **mission mode**.
- ix. In the land areas not suitable for crop production, farmers may be encouraged and provided assistance for undertaking timber and/horticultural plants. For this, some incentives may also be considered by the respective departments.
- x. Last but not the least, **liquor intake**, particularly by male members of tribal families, is widely prevalent in life style of Jharkhand. This brings reluctance in farm and social activities, particularly among male cultivators resulting in land left fallow despite their proven physical strength and high working efficiency. **Appropriate Awareness Drive** may be undertaken in this regard by involving **GOs and NGOs**.

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**Review of Reports on Dynamics and Revival of Fallow Land
(Madhya Pradesh, Jharkhand, Maharashtra and Kerala)**

by

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Reports by

1. Gokhale Institute of Politics and Economics, AERC, Pune
Investigator- Jayanti Kajale and Sangeeta Shroff, Study Area- Maharashtra.
2. AERC, Bhagalpur
Investigator- Dr. Rajiv Kumar Sinha, Study Area- Jharkhand
3. AERC, Chennai, University of Madras
Investigator- Dr. K. Jothi Sivagnanam, Study Area- Kerala
4. AERC, Jabalpur
Investigator- Dr. Hari Om Sharma, Study Area- Madhya Pradesh

Dear Friends and collaborators

As you may be aware I am assigned to handle the coordinated study as of now. Thank you for the opportunity and your cooperation.

I have gone through the documents in hand i.e., questionnaires circulated and the four draft reports from you. Keeping the information collected by you as presumably advised by the earlier coordinator and the need for consistency among the studies in mind before compiling and comparing the results I am making the following comments. I also add some minimal suggestions for making sense of the results obtained from diverse field studies for consolidating the final report (which is usual in coordinated studies).

I may mention that there are some variations among the reports in terms of specific aspects addressed and tables made. Also, there are limited inadequacies for drawing inferences at

least at an integrated level. Therefore, all though the suggestions are common some of them may have been already addressed in one or more of the reports and the researchers may ignore my comments if the work is already done.

My ideas are obviously based on an integrated look at all your reports and my suggestions are drawn from the strengths of each report.

1. My first comment is on the scattered nature of the tables and write-ups that fail to bring out clear conclusions. The reports need to be more reader friendly and bring out clear inferences from the work done. My suggestions aim to help you in this.
2. The Chapters may please be reorganized to maintain an order. The 'Method' chapter must lay down not only the sampling method (which is evident in all cases) but also the other methods (such as statistical techniques, regressions if any (as done by AER, Jabalpur), ratings (done by all Centres for identifying factors causing fallowing but not explained by any one), the qualitative (perception based) approach, definitions and specifications (most have done this), selection of districts (AERC, Kerala may explain this) and any other method used.
3. In the same chapter, a background needs to be given of the specific state using only latest available data :
Economy: per capita GDP if available, sectoral composition of GDP, poverty rate, Infrastructure (whatever data you can give roads, electricity etc. per capita), GDP growth, population growth (base to current preferably or Census based) share of rural population, Education statistics etc. *Employment indicators for rural sector*: Population growth rate, rural share, female headed household share, Work force participation, Employment in Agriculture (from Census) etc., *Land use*: Geographical features, Farm size, Share of Marginal and Small farms, Irrigation share on GCA, NSA and sources of irrigation, Cropping intensity, Rainfall, drought-prone or flood prone districts, *Agriculture*: Major crops and cropping pattern (share of Rice, Wheat, Pulses, Oilseeds, F&V, Plantations), Yield rates of major crops etc. My indicators can serve only as some suggestions.
4. Similar background with tables (as in point 2) may be provided for the selected sample districts too subject to data constraints.
5. For easy reading, the tables (2-3) should be consolidated as possible, based on latest data with clear mention of reference year, source, explanations for short forms. Some of you have given much of the information I mention in different tables but may

consider consolidating/reformatting the tables. I have given a crude format at the end (A2) but you may improve on that and add more/less information than I suggested.

6. The background tables must be backed up by descriptive assessment with writer's insights, literature and official report review (not repeating data already seen in the Tables), mentioning any special feature (such as in geography or water shortage, natural disasters, farmer distress, conflicts or any other events in news relevant to the context of economic decision making).
7. Tables on land use and CAGR of land use categories are part of the substantial results of the study using secondary data and are important to merit a consolidated chapter. These tables on state total and districts etc., may be given in a common chapter following the chapter on method (some of you have given some district tables in the Method chapter to explain the sample selection which is OK but that is for a different purpose).
8. There is total confusion with the reference years for secondary data based study on trend in fallow land in districts. District level data not being updated, regular and consistent can be a cause for this divergence. AERCs in Jabalpur and Bhagalpur treated 2001-03 as base and 2012-2014/2014-16 as current years and calculated CAGR between the two trienniums. AERC in Madras (on Kerala) gave data on and CAGR between 1990-91 and 2015-16. AERC Pune gave Land use data for districts for current period (year is not clear). They also gave decadal CAGRs and a few long period CAGRs starting from 1980.
9. Based on all this multitude of information I suggest all of you to provide the district level land use data for latest 3-year average (stating the years and the source) and one from early 2000s three year (specify years and source). Also, please give CAGR between the two trienniums. The Kerala study may have to provide the CAGR and data for the base year and Maharashtra study has to provide data for a base year.
10. The land use and CAGR must be given in tables both for the state and all districts in the state.
11. In the primary study, to arrive at a meaningful distinction among following tendencies, I would suggest making a separate single Table to give Fallow tendency (as %) against different socio-economic and endowment indicators. Similar work has actually been done through several tables leaving the reader confused. A rough format for the table (with minimal adjustments) is given in A3 below. The discussion

will compare among groups such as say small farmers and large farmers, social groups, cereal growers and commercial crop growers etc. in respect of their land fallowing tendency.

12. Any, programme if discussed, may have relevance to land use and fallow land. The report on Kerala makes a focused study on Kudumbashree but unfortunately it does not specifically throw any light (except in a small section) on its influence on land fallowing. I would suggest keeping the details on the programme in Appendix but discuss the fallow land implications in the text if possible also with tables. Otherwise the section does not fit in with the main topic.
13. The objectives stated by the Centres are not all same. According to my records the list of objectives are as given below (see A1 below) and these are mentioned by some of the Centres. However the last two objectives are hardly addressed. In the study by AERC Pune a last section (4.8) is devoted to this aspect based on perceptions. This section could be expanded to address the objectives. In fact, the subjective response based findings on fallowing stated in the Appendix may be discussed by AERC Pune in this section more in detail. This approach is advisable for others making use of subjective responses. In any case if data collected permits, the sections may be written to answer the questions raised in the last two objectives only if there is substantial information. Otherwise these objectives must not be mentioned at the outset. The Centres may decide.
14. AERC Bhagalpur (only) has mentioned the crops grown before 'seasonal' fallowing. Other can follow if data is available.
15. It is strange and disappointing to find that in a responsible team work, the hard work put in by the actual earlier coordinator (Dr. Thiagu Ranganathan), who prepared the study design, questionnaire etc. is not acknowledged. To make the report acceptable kindly acknowledge and mention the coordinators Thiagu Ranganathan and Nilabja Ghosh.
16. There are spelling mistakes, other grammatical errors and lack of clarity in tables (headings or Note) that may be corrected. If additional information and tables are provided in the reports compared to what is suggested by the reviewer), they may continue.

A1. Research Objectives

The research will address the following questions:

- What are the trends related to area under fallow land (current and permanent) in India?
- What are the reasons for which farmers are leaving the land fallow?
- What are the low cost or no cost measures to reduce area under fallow land?
- What are the crops that are suited for cultivation in fallow/fragile land?

A2: Table suggestion. The formats are as suggested. Hope the last table with household data can be made with SPSS or similar other software. May us ask for help if needed.

Table: Land use in ** Districts of XX from Secondary data

All Districts of the state and State total	Land use categories (Acres)	
Current year		
1		
2		
Base year		
1		
2		

Table: CAGR in Land use in ** Districts from Secondary data between current years (**) and Base Year (**)

All Districts of the state and State total	Growth rate%	

Table: Socio-Economic Description of Districts in Secondary data (only latest data available)

All Districts of the state and State total	GDP, Sector poverty etc (see point 4)	

A3: Fallow land (%) of households in different categories

Indicators	District 1	District 2	Overall
SC			
ST			
OBC			
Marginal			
Small			
Irrigated			
Main crop			

Annexure - II

Action Taken Report

1. Presented as per initial study and table design.
2. Other methods added under section 2.2 of methodology.
3. Background of the state given at appropriate place.
4. Already provided.
5. Done.
6. Descriptive assessment already given.
7. District tables given and explained in the chapter of Method as per final study design.
8. As Jharkhand state came into existence in November 2000, so the base year used for triennium is 2001-03.
9. Already provided.
10. Land use and CAGR already given in tables both for the state and all districts.
11. Added as per suggestion.
12. No action needed.
13. All Objectives as per original study design addressed, and hence, no action required.
14. No action needed.
15. Suggestion incorporated at appropriate place under **Acknowledgement**.
16. Spelling mistakes and other grammatical errors corrected.

Dated : 23/12/2017

Dr. Rajiv Kumar Sinha
Research Associate-Cum-Project Leader

- NB:
- i. Draft report **dispatched on 03/08/2017** to the Co-ordinating Centre (IEG, Delhi)
 - ii. Comments on draft report **received on 26/09/2017** from the Co-ordinating Centre (IEG, Delhi)

Appendices

Appendix I: Cropping Pattern of the selected Farmers in the selected districts of Selected State during the study periods (*Area in Acres*)

Districts I (Ranchi)	Area Under Crops					Area Under orchards					Irrigated				
	Marginal	Small	Medium	Large	Average	Marginal	Small	Medium	Large	Average	Marginal	Small	Medium	Large	Average
Block I (Kanke)	28.81	24.63	15.05	---	2.28	---	---	---	---	---	6.00	6.00	10.20	---	0.74
Block II (Namkum)	54.19	---	---	---	1.81	---	---	---	---	---	10.45	---	---	---	0.35
District II (Ramgarh)															
Block I (Gola)	52.71	6.50	---	---	1.97	---	---	---	---	---	9.62	3.00	---	---	0.42
Block II (Patratu)	20.85	64.11	---	---	2.89	---	---	---	---	---	4.00	16.60	---	---	0.69

Appendix II: Structure of Assets of the sampled farmers in the Selected Districts during the study Periods

Districts	No. of Milch Animals (avg.)					Avg. No of Pump Set					Avg. No of tractors					% of Threshed Home					% of Concrete Home					
	Marginal	Small	Medium	Large	Average	Marginal	Small	Medium	Large	Average	Marginal	Small	Medium	Large	Average	Marginal	Small	Medium	Large	Average	Marginal	Small	Medium	Large	Average	
District I (Ranchi)	60	10	2	---	1.20	8	2	2	---	0.20	1	1	---	---	0.03	---	---	---	---	---	---	---	---	---	---	---
District II (Ramgarh)	40	21	---	---	1.02	7	7	---	---	0.23	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
State	100	31	2	---	1.11	15	9	2	---	0.22	1	1	---	---	0.03	---	---	---	---	---	---	---	---	---	---	---

Appendix III: Distribution of Loan Taken by different categories of farmers in the Selected Districts

Districts	Amount of Loan Taken (in Rs.)					Avg. Amount of Loan per sampled Household (in Rs.)				
	Marginal	Small	Medium	Large	Averg.	Marginal	Small	Medium	Large	Averg.
District I (Ranchi)	49400	12300	2500	---	1070	4940	6150	2500	---	4938.46
District II (Ramgarh)	44600	29600	---	---	1237.67	4955.56	4933.33	---	---	4946.67
State	94000	41900	2500	---	1153.33	4947.37	5237.50	2500	---	4942.86

Source: AERC reports from the particular centre for the study periods.

Appendix IV: Source-wise Loans taken by different categories of farmers in the selected Districts (In Rs.)

Districts	Institutional Sources					Expend on Productive purposes				
	Marginal	Small	Medium	Large	Averg.	Marginal	Small	Medium	Large	Averg.
District I (Ranchi)	7500	---	2500	---	166.67	4594	5842	2500	---	995.08
District II (Ramgarh)	12300	5000	---	---	288.33	4790.54	4850.94	---	---	642.77
State	19800	5000	2500	---	227.50	9384.54	10692.94	2500	---	806.34

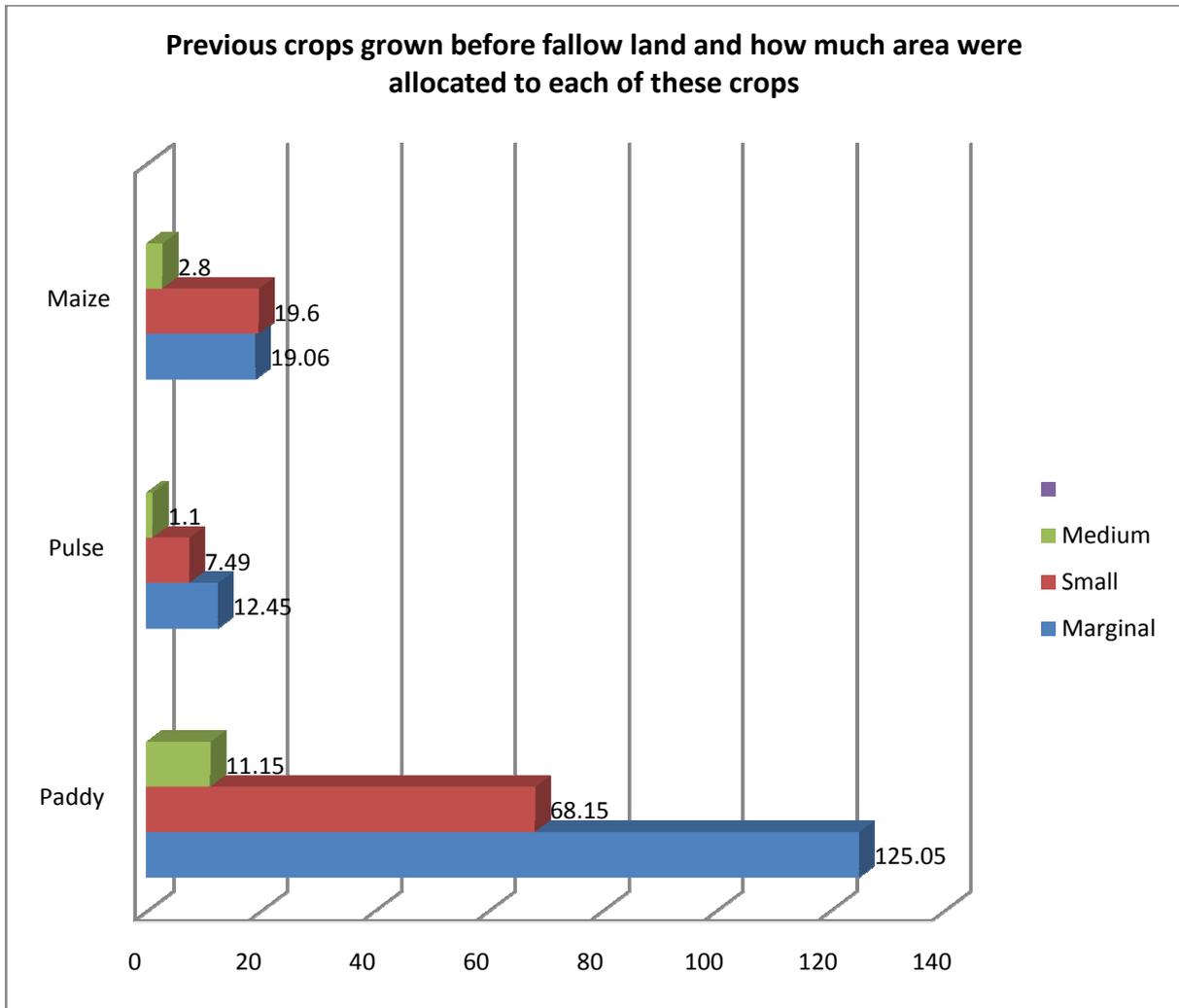
Appendix V: What were the previous crops grown before fallow land and how much area were allocated to each of these crops (In Acre)

Crops					
	Marginal	Small	Medium	Large	Average
Paddy	125.05	68.15	11.15	---	1.70
Wheat	---	---	---	---	---
Pulse	12.45	7.49	1.1	---	0.17
Maize	19.06	19.60	2.8	---	0.35

Appendix VI: Indicate if you will return to farming if following things happen

Procurement is made fair and assured	Insurance is provided	Credit is made available timely	Assured Irrigation is made available	Output markets are improved	Extension is provided	Storage facilities are improved	Have you ever tested your soil ?
39.17	90.83	100	100	58.33	30.83	27.5	23.33

Appendix Figure – I



Appendix Figure – II

