A Study of agriculture diversification in morena district of Madhya Pradesh

THESIS

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By

Kuldeep Singh Baghel

Department of Agriculture Economics

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

College of Agriculture, Gwalior (M.P.)

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CERTIFICATE – I

This is to certify that the thesis entitled **"A Study of agriculture diversification in morena district of Madhya Pradesh** "submitted in partial fulfilment of the requirement of the degree of Master of Science in Agriculture (agriculture economics & farm management) of the RVS Krishi Vishwa Vidyalaya, Gwalior is a record of the bonafide research work carried out by **shri kuldeep singh baghel** under my guidance and supervision. The subject of the thesis has been approved by Student's Advisory Committee and the Director of Instruction.

No part of the thesis has been submitted for any degree or diploma (Certificate awarded etc.) or has been published/published part has been fully acknowledged. All the assistance and help received during the course of investigation has been acknowledged by him.

Place : Gwalior
Date :

(Dr. A.M.Jaukar)
Chairman Advisory Committee

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Chairman	**(Dr. A.M.Jaukar)**	_____
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Member	**(Dr. S.K.Badodiya**	_____
Member	**(V.B. Singh)**	_____

CERTIFICATE – II

This is to certify that the thesis entitled **"A Study of agriculture diversification in morena district of Madhya Pradesh** submitted by Kuldeep singh baghel to the RVS Krishi Vishwa Vidyalaya, Gwalior in partial fulfilment of the requirements for the degree of Master of Science in Agriculture (Extension Education) in the Department of Extension Education, College of Agriculture, Gwalior has been, after evaluation, approved by the External Examiner and by the Student's Advisory Committee after an oral examination of the same.

Place : Gwalior
Date :

(Dr. A.M.Jaukar)
Chairman Advisory Committee

THESIS APPROVED BY THE STUDENT'S ADVISORY COMMITTEE

Chairman	**(Dr. A.M.Jaukar)**	_____
Member	**(Dr. J.S. Raghuwanshi)**	_____
Member	**(Dr. S.K.Badodiya**	_____
Member	**(V.B. Singh)**	_____

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Dean _____
Director of Instructions _____

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Place: Gwalior

Date: **(kuldeep singh baghel)**

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Chapter I

INTRODUCTION

1.1 AGRICULTURAL DIVERSIFICATION

Agricultural diversification refers to the development of greater variety of agricultural crops within space and time. It takes place with an increase in population and a decrease in per capita cropland. A sustained economic growth, rising per capita income and growing urbanization are ostensibly causing a shift in the consumption patterns in favour of high-value food commodities like fruits, vegetables, dairy, poultry, products from staple food such as rice, wheat and coarse cereals. The demand for and supply of these commodities have grown much faster than those of food-grains. Such a shift in consumption patterns in favour of high-value food commodities even among the poorest strata of the Indian society depicts an on-going process of transformation that is leading towards a 'silent revolution' of agricultural diversification. This revolution or process of transformation is also reflected in the rising exports of high-value agricultural products. The changing scenario of agriculture has forced the farming community and policy makers in agriculture to search for a more remunerative and viable crops. The diversification of agriculture towards non-food-grain and high value commodities has been the right answer for it, because these commodities have potential of income augmentation, employment generation, poverty alleviation and export promotion. It is, therefore, important to diagnose the production-consumption linkages in the context of agricultural diversification. It will enquire identification o the driving forces that can alter production and consumption pattern. It is also important to understand how the production pattern is evolving itself in response to changes in the consumption pattern, in a scenario where smallholders dominate agriculture and a majority of them live in the rural areas.

Agricultural diversification is slowly picking up momentum in favour of high-value food commodities primarily to augment income rather than the traditional concept of risk management. The nature of diversification differs across regions due to existence of wide heterogeneity in agro-climatic and socio-economic environments. It was considered interesting to delineate the key regions and sub-sectors of

agriculture where diversification was catching up fast. Crops, livestock, horticulture and forestry constitute the core sectors of agriculture. The crop sector is the principal income-generating source in agriculture followed by the livestock sector. It is depicted a steady diversification here with replacement of food-grain crops with nonfood-grain crops. Several non-food-grain crops such as fruits, vegetables, and medicines have substituted mainly coarse cereals in the farmers' pursuit for higher income. The government-supported programmes had promoted the cultivation of fruits and vegetables. Among others, watershed program had facilitated conservation of rainwater and gave higher priority to the cultivation of fruits and vegetables.

The present study while examining the pattern of diversification in agriculture also assesses the potential of the so-called high value commodities in augmenting agricultural diversification. The study takes into account alternate definitions of agricultural diversification; first definition is based on a concentration index, whereas second is based on the percent of gross cropped area under non-food crops. Also it takes note of different bases of measuring diversification more importantly, income, output and resource based agricultural diversification. While income or output diversification has been studied at the state level as well as district; resource diversification is examined at the level of state and district. After studying resource diversification at the state level as also involving district; one of the relatively progressive Madhya Pradesh state has been chosen purposively to study diversification at the level of state involving districts of the state. An average farm is finally, chosen to study diversification at the micro level.

1.4 OBJECTIVES OF THE PRESENT STUDY

The present study aims at identifying and evaluating the diversification of agriculture followed in dry regions of Morena district of Madhya Pradesh. For an in depth study, six major farming patterns were identified. In the light of these aspects the present study was purposively undertaken in Morena district (North region of Madhya Pradesh). The overall objective of the study was to identify the major farming systems practiced by the farmers and to determine the system, which produces the maximum favorable impact on income of the farmers in Morena district of Madhya Pradesh.

Specific objectives of the study

The specific objectives of the study were:

1. To study the analysis of Agricultural diversification

2. To analyze the strategy for minimization tha risk in agriculture farming

3. To Seek suggesting for information delivery and market linkage services

The hypotheses outlined for the study were:

1. Diversification does not reduce risk in Agriculture

2. Risk coping strategies are mainly include crop and enterprise diversification

1.5 SPECIAL FEATURES OF THE STUDY

The focus of this study is to evaluate diversification of agriculture based farming systems adopted by the farmers in the study area. It may serve as a basis for advocating appropriate changes in the prescribed farming pattern and to suggest rational farming patterns.

1.6 LIMITATIONS OF THE STUDY

The present study is based on primary data. Since data were collected by survey method, the inherent lacunae associated with this type of enquiry have crept into the study. Due to some limitations of software integer programming was not performed which has more relevance in dairy and poultry enterprises. In farming system studies risk efficient farming system should be included, however due to high quantum of study this aspect was not considered. The primary data is based on the memory recall of the sample respondents as farmers seldom keep records, sincere efforts have been made to elicit the accurate information by cross questioning. However, the degree of discrepancy, if any, would be negligible as the estimates presented are on averages.

Chapter II

REVIEW OF LITERATURE

In this chapter, a review of past research works in the field has been compiled to enable better understanding of the research in various regions and method of analysis on the research subject. The chapter is presented under the following headings.

2.1 Different type of farming pattern on the farm

2.2 strategy for minimization the risk in agriculture

2.3 information delivery and market linkage services

2.1 Different type occupation on the farm

Singh (1992) while studying the economics of farming systems in Kangra district, observed that holdings were small and fragmented. It was suggested that consolidation should be given priority and norms should be devised to maintain the minimum size and ornumber of fragments of the farm. Further he suggested that profitable farming systems such as vegetable based and dairy based should be encouraged. Appropriate input supply base and market infrastructures development, inter sectoral linkages among the sub-systems formed strong input bondage and linkages among cereals, livestock and agro-forestry. Pronounced technological gaps in all the important components of farming systems was identified and it was recommended that farmers should be educated or trained about the balanced use of critical inputs like quality seeds, chemical fertilizers, herbicides, *etc*, in the crops and quality seed and fodder in case of dairying by extension agencies. Various alternative plans in this study portrayed cascading effect of reallocation of land, technological adoption and inclusion of subsidiary enterprises for enhancing farm income and employment.

Rangaswamy *et al*. (1992) in a study to evolve a economically viable and sustainable farming system for small and marginal farmers in rice based wetlands of

Coimbatore opined that the net profit worked out under integrated farming system was 100 per cent higher than the conventional cropping systems followed in these wetlands. The additional employment generated through integrated farming system over conventional cropping system was 48 per cent higher. They finally concluded that farming system, comprising crops, poultry, fisheries and mushroom production enhanced the net income of the low land rice farmers.

Jayaram *et al*. (1993) conducted a study on the feasibility and economics of integrated fish culture. Results revealed that the integrated fish culture system was found to be profitable small-scale system. The total returns and returns less total cost were Rs. 20,848 and Rs. 5,290, respectively. The system also generated 92 mandays of employment.

Vishweshwar (1994) employed Cobb-Douglas type of production function to measure the efficiency of inputs used in the production of cotton by IPM and non-IPM adopted farmers in Malaprabha command area in Karnataka. The study indicated that the ratio of MVP to MFC for land was greater than one, while it was less than one for labour. It was negative for seeds, fertilizers and pesticides in conventional farmers. In case of IPM adopted farmers, the MVP to MFC ratio for land, labour, seeds and fertilizers were greater than one and it was negative for fertilizers.

Nagraj *et al.* (1996) in their study to evaluate the economics of maize-sunflower cropping system at different size group of farmers of Tungabhadra command area, concluded that the variation in the gross returns explained by the variables included in the production function analysis was to the extent of 89.49 per cent and 99.03 per cent in maize and sunflower, respectively. The resource use efficiency indicated that land, manures and fertilizers together had maximum influence on gross returns of maize and in the case of sunflower after maize, land was the single most factors that greatly influenced the gross returns.

Koppad and Khan (1996) made a comparative economic analysis of two cropping systems *viz*., maize-wheat and maize-sunflower on large farmers in Malaprabha command area, Karnataka. Comparison of resource use pattern showed that human and bullock labour were higher in the maize-sunflower system, while use of fertilizers was higher in maize-wheat system.

Korikanthimath *et al*. (1996) conducted a study for three years on mixed cropping of *Arabica* coffee with cardamom verses sole crop of arabica coffee. The study revealed that the cost of cultivation was higher in mixed cropping than mono-cropping. The highest net returns of Rs.2, 02,690 per hectare was realized in mixed cropping due to a bumper crop of cardamom when averaged over three years; the returns of mixed cropping were 4.04 times greater than those of mono-cropping.

Korikanthimath *et al*. (1997) in their study carried out on mixed cropping of *Areca catechu* and cardamom in comparison with mono- culture of *Areca catechu* concluded that the cost of cultivation was higher in mixed cropping than under mono-culture and correspondingly, the net return realized in mixed cropping was also 1.56 times higher than in mono-culture. The incremental net gain in mixed cropping was Rs.58, 211 per hectare. Benefit cost ratio was higher by 1.01 times under mixed cropping compared with monoculture.

Naik *et al*. (1998) while analyzing the resource use efficiency and productivity at various factors involved in onion production using Cobb-Douglas production function observed that land and farmyard manure were positive and highly significant.

Alagumani and Anjugam (2000) in their study on impact of dairy enterprises on income and employment in Madhurai district of Tamil Nadu found that about 57 per cent of the farm households were engaged in dairy enterprises and 43 per cent of them were having both crop and livestock enterprise. Additional income and employment generated per household were Rs.4900 and 365 mandays, respectively.

Ganesh (2000) made an evaluation of alternative farming systems in Gazani lands of coastal Karnataka *viz*., paddy cultivation, paddy cum prawn farming and mixed farming. The study revealed that highest net income was realized from mixed farming in small and large farms Rs.2, 52,495 and Rs.2, 27,082 respectively.

Ganesh (2000) analysed resource use efficiency for mixed farming systems in Gazani lands of Karnataka. Results of the study indicated that about 98 per cent of the total variation in gross income was explained by the variables included in the production function. The resources like fish, fingerlings, manure and labour had significant effect on the gross returns.

Verma (2002) employed Cobb-Douglas production function for evaluating resource use efficiency in onion. The marginal value product of seed, manures and

fertilizers, human labour and machine power were (Rs. 0.15, Rs. 1.51, Rs. 0.69 and Rs. 0.28 respectively) found to be positive on small farms while it had negative value on bullock labour, plant protection and irrigation (Rs.–0.13, Rs. –0.49 and Rs. –0.47 respectively). This implies that the small farms were under utilizing seed, manures and fertilizers, human labour and machine power and bullock labour, plant protection and irrigation were used excessively on the farms. In case of large farms, marginal value product of seed, manures and fertilizers, human labour, bullock labour and plant protection were (Rs. 0.80, Rs. 0.34, Rs. 0.18, Rs. 0.01 and Rs. 0.15) respectively found to be positive while it had negative value of machine power and irrigation (Rs.–0.16 and Rs-0.01) respectively implying that large farms were under utilizing seed, manures and fertilizers, human labour, bullock labour and plant protection while machine power and irrigation were over utilized by the large farms. Thus indicating there is scope for increasing their use up to the optimum level where the efficiency of the input use is maximum.

Wadear (2003) while analyzing the resource use efficiency and productivity at various factors involved in different animal based farming systems in the three dry zones of Northern Karnataka, concluded that, the milk production increased with the farm size and ranged from 4.5 to 5.0 litres per day per animal. In milk production, green fodder, concentrates and labour were significantly contributing factors in all the three zones.

Sunanda and Narender (2003) while studying resource productivity of mesta farms in Srikakulam district of Andhra Pradesh, observed that mesta fibre accounts for 70 per cent of raw jute. The cultivation involves intensive human labour in addition to manures and fertilizers, seed and cattle labour. The Cobb-Douglas production function analysis for these variables indicated constant returns to scale on all farm size groups. The marginal value product to opportunity cost ratios for all farm size groups indicated resource use efficiency and revealed the scope of adjustments and reorganisation of resources, so as to obtain higher returns in mesta cultivation.

Wadear (2003) while analyzing the resource use efficiency and productivity at various factors involved in different animal based farming systems in the three dry zones of Northern Karnataka, concluded that the milk production increased with the farm size and ranged from 4.5-5.0 litre/day/animal. In milk production, green fodder, concentrates and labour were significantly contributing factors in all the three zones.

Jha (2004) some of the livestock–related development has however, reduced competition between food and fodder. The livestock population has been decreasing in the recent period. There have been structural changes in the bovine population as well. The structural changes are in the form of increased population of buffalo and replacement of *desi* cow with cross-bred cow.

Rajeshwari (2004) in her study carried out on coconut based farming system in Tumkur district of Karnataka, opined that the net farm income was higher in Farming SystemV (coconut, arecanut, ragi and dairy), but the generation of employment, both human and bullock, were high in Farming System-II (coconut, greengram, *rabi* ragi, dairy) as farmers were taking up labour intensive enterprises under this farming system.

Rajeshwari (2004) analysed resource use efficiency for coconut based farming systems in Tumkur district of Karnataka, using Cobb-Douglas production function. She observed that the capital and feed in Farming System-I, (coconut+greengram followed by ragi+dairy) number of cows in Farming System-II, (coconut+greengram+groundnut followed by ragi+dairy) labour in Farming System-III, (coconut+paddy+greengram followed by ragi+dairy) land, labour, feed and number of sheep in Farming System-IV (coconut+greengram followed by ragi+dairy+sheep) and land and number of cows in Farming System-V (coconut+arecanut+ragi+dairy) had positive and significant influence on gross returns.

Singh (2004) during his study on economics of efficiency in vegetable business system reported that cost of cultivation for tomato, onion arvi, okra, brinjal and potato was estimated Rs. 12,599.00, Rs. 13,338.10, Rs. 9,742.10, Rs. 10,046.40, Rs. 11,274.60 and Rs. 13,480.20 per hectare respectively. Further, it also showed that about 95 per cent of the cost of cultivation of these vegetable consisted of human labour and working capital cost. The bullock labour cost for these vegetable ranged from 4 to 5 per cent. The per hectare net profit of vegetable growers for tomato, onion, arvi, okra, brinjal and potato were estimated to Rs. 31470.25, Rs. 2644.34, Rs.22015.90 and Rs. 31353.60, Rs. 29205.40 and Rs. 25328.25 respectively.

Saikumar (2005) studied the resource use efficiency in different farming systems of three districts of north-eastern Karnataka employing the Cobb-Douglas

production function. The adjusted R2 was 0.76, 0.58 and 0.54 for Bidar, Bellary and Raichur districts, respectively, indicating that 76, 58 and 54 per cent of variation in yield could be explained by the estimated production function. The coefficient of cost of seeds and cost of feeds+concentrates in Bidar, fertilizer+FYM cost in Bellary and fertilizer+FYM cost and labour cost in Raichur district were positive and significant at 5 per cent probability level.

Suresh and Reddy (2006) while studying the resource use efficiency of paddy cultivation in Peechi command area of Thrissur district of Kerala, has examined the resource productivity and allocative as well as the technical efficiency of paddy production. The study has used the primary data collected from 71 rice farmers of the command area using the stratified random sampling. The cost of cultivation of paddy in the command area has beenfound as Rs 21603 per ha, resulting in a BC ratio of 1.34. The elasticity co-efficient for chemical fertilizers, farmyard manure and human labour, have been observed significant and positive. The allocative efficiency has indicated that marginal return per rupee increase under these heads would be Rs 2.83, Rs 1.57, Rs 1.17, respectively. The average technical efficiency of the paddy farmer in the command area was been found as 66.8 per cent. Education of the farmer and supplementary irrigation provided during the water-stress days have been identified as the major factors, which could enhance the technical efficiency. The study has called for an equitable distribution of canal water and enhanced extension services for resource management in the area.

Tanveer (2006) made a comparative analysis of four major paddy based farming systems in Mandya district (Karnataka), viz, FS-I (crop production and poultry enterprises), FS-II (crop production and dairy enterprises), FS-III (crop production and sericulture enterprises), FS-IV (only crop production enterprises). The analysis revealed that net farm income would range from Rs.171933.81 to Rs.1875555.00, Rs.54720.59 to Rs.62330.67, Rs. 83658.40 to Rs.106867.10 and Rs.57739.53 to Rs.85919.80 in FS-I, FS-II, FS-III and FS-IV, respectively.

Bezabih and Hadera (2007) The different forms of crop diversification are crop rotation and intercropping. Intercropping is the most common form of enterprise diversification in eastern Hararghe. The result of the survey indicates that farmers intercrop for three major reasons: to increase soil fertility, better use of resource (land in this case since it is scarce) and for minimizing risk due to loss from another

enterprise(s). The advantage of intercropping may also entail supplementary relationship which calls for physical support of one crop to the other crop and erosion control through providing continuous leaf cover over the ground surface.

2.2 Risk coping strategy of farmers in agriculture

Alderman and Paxson (1992) Income diversification is widespread in the rural areas of developing countries. Households in rural areas can reduce risk by choosing crops whose yields or prices display low correlations, planting crops on scattered plots that are subject to different weather shocks, using a variety of production techniques, or choosing a blend of farm and non-farm occupations.

Paxson's (1992) study of rice farmers in Thailand provides convincing evidence that farmers respond differently to transitory and permanent income. Most rice farms in Thailand are not irrigated, so crop yields depend on the amount of rainfall, with more rainfall generally resulting in higher income. Paxson argues that income associated with good rainfall is transitory, with close to no direct effect on permanent income. Doing regression analysis, which allows the transitory component of income to be isolated from permanent income, she finds that permanent income is much more important in determining consumption than is transitory income. These Thai rice farmers thus appear to recognise that it is wise to lay aside a substantial fraction of the rain-induced income.

Rosenzweig and Binswanger (1993) investigate the effects of risk on the allocation of production resources among farmers, differentiated by wealth. Using the panel data set from the ICRISAT villages in India and its information on investment, wealth and rainfall, they examine how the composition of productive and non-productive asset holdings varies across farmers with different levels of total wealth and across farmers facing different degrees of weather risk. The results show that farmers in riskier environments select portfolios of assets that are less sensitive to rainfall variation and less profitable.

Bellon and Taylor, (1993) Engaging in multiple activities may not be risk reducing in itself, of course, since moving from specialisation in a single, conservative activity to undertaking a mix of riskier activities can increase risk. Farmers may also have other motives behind engaging in multipleactivities than avoiding risk. They can engage in different activities to increase income. They may try to smooth out labour

requirements when labour markets are imperfect, or produce commodities the household demands but for which markets are non-existing or imperfect. Another reason could be heterogeneous land qualities within the farm, which imply that different crops or varieties are profitable when cultivating the different land qualities.

Townsend (1994) shows that within each of three villages in India, particular household incomes vary considerably over time from the village average. This is true whether the household is landless or is a small, medium or large landholder. Townsend shows that incomes do not comove across households in each of these villages because households earn their incomes in different ways, and are thus subject to different household specific risks.

David (1995) household preferences in different farm components correspond to alternative livelihood activities and strategies which depend on the natural and socio-economic environment in which farm households take decisions in addition to the perception of risk, sources of risk and opportunities to respond to risk. The FSA is preparatory to on-farm research, which is supposed to pursue solutions for the integration of woody plants into current land use types.

Deaton (1997) also found little evidence of covariation between incomes for different farmers in the same location. He argues that crops in these villages are certainly affected by weather conditions, and fires in the cocoa and coffee-growing areas are frequent occurrences, so the absence of significant village-level effects on household income remained a puzzle. He argued that if village effects exist, they were swamped by intravillage variation from one household to the other.

Holden and Binswanger (1998) point to research from India showing that formal credit facilities were more developed in low-risk than in high-risk areas. However, in the absence of formal insurance and credit institutions, households find other ways of dealing with income risk.

Basavaraj and Kunnal (2002) identified the constraints in production, marketing and processing of soybean in Belgaum district. It was observed that severe problems faced by growers were rust disease leading to heavy loss, high labour wages and non-availability of quality seeds in the production front. In marketing, farmers experienced problem of price fluctuation, low price for the produce, problem of transportation and delayed payment of sale when produce was sold to co-

operative society. The other problems were inadequate power supply and non-availability of labour at critical times faced by the processor.

Pandey *et al*. (2002) Farmers in the developing world through their long experience have adapted certain varieties and agronomic practices to cope up with the risk they face under the situations to reduce substantial income-losses.

Dercon (2002) In Ethiopia, farming is particularly weather-dependent and farmers face price, yield and resource risks that arise from the biophysical and socio-economic environment in which they operate. Rural households in the country are exposed to a variety of risks that include harvest failure as a result of drought, frost, floods and other climatic events and death of livestock. These risks influence the production and resource allocation decisions of smallholder farmers. Lack of institutional innovations such as credit and insurance schemes in most developing countries makes individual risk management a significant issue to cash-constrained smallholder farmers.

Dercon (2003) further states that the combination of sources of income is not always intended to manage risk. First, different activities have positive cash flows in different times of the year, providing income through the year. This type of diversification is intended to address discrepancies in seasonal cash flows, not unexpected shocks. Second, the income of farm and off-farm activities may be correlated during times of crisis, which limits the scope of the desired diversification.

Benin *et al*. (2004) the coefficient of livestock ownership as is negative and significant at 5% indicating an inverse relationship between livestock ownership and crop diversification. The explanation for the result is, livestock as measure of wealth may act as insurance against crop production risk, bearing a negative relationship with crop diversification. So, households with large number of livestock are less likely to grow more crops. The result is consistent with the findings of Benin *et al*. (2004), but in contrast to that of Feiten *et al*. (2009).

Hoddinott and Harrower (2005) and Dercon, Hoddinott and Woldehanna (2005) particularly in the case of covariate shock such as drought, informal risk coping mechanisms that depend on neighbors are not effective because many households within a certain region suffer simultaneously, and as a result the reduction of consumption level is not only severer but also more persistent.

Boucher *et al.* (2005) analyzed that in the presence of moral hazard lenders required borrowers to bear some contractual risk, and if this risk was sufficiently large, farmers preferred not to borrow even though the loan would raise their productivity and expected income.

O'Donnell and Griffiths (2006) argue that all nonstate-contingent analyses decompose the deviations from the frontier into inefficiency and noise, while statecontingent frontier models decompose these deviations into inefficiency, noise, and risk. The Chambers and Quiggin's framework allows them to find a more accurate measure of inefficiency. The framework and the empirical method to decompose output shortfall into inefficiency and risk components have very important implications for agriculture.

Wencong *et al.* (2006) the decision maker's risk preference affects the type of agricultural activities and corresponding scales that are selected. It also affects micro agricultural production structure and stable growth of households" income. Given a fixed amount of productive resources such as arable land, capital and labor force, the combination of production activities with the highest level of expected income/risk would be selected if the decision maker was a risk taker. For combinations of activities with a lower risk level, diversification might reduce risks to some extent at a cost of total return. Risk management strategies can be classified into two broad categories; ex-ante risk management and ex-post strategies.

Capitanio (2008) the economic performance of the agricultural sector is usually uncertain due to its biological nature in addition to relying mainly on rain fed agriculture and livestock rearing under natural conditions. This type of production is inherently risky because of variability of rainfall, animal mortality due to livestock diseases and fluctuations in output prices. The environment in most of low income countries is characterized by crop diseases, flooding, illness of household members and crime. All these create uncertainty.

Nesslie Monsanto and Gloria Luz M. Nelson (2010) the impact of these typhoons particularly typhoon Ondoy was heavily felt by the agricultural sector. Agricultural losses from typhoons Ondoy and Peping is estimated to be 10 billion pesos. The results of the survey revealed that seventy five percent (75%) of the farmers borrowed the capital they used on the crops destroyed by the typhoon.

Because the relatives of the farmers were also poor, rice farmers cannot rely on them during crisis for financial support. In both the survey and the case studies, it was seen that other than seedlings, relief goods were the biggest help provided by government and other organizations to the rice farmers.

Marzieh Keshavarz *et al.* (2010) the impacts of drought are diverse although can be broadly classified as being economic, environmental and social. They can be direct as well as indirect. In societies where agriculture is the primary economic activity, the direct, or first-order, impacts of drought take the form of decrease food production via a reduction in cultivated area and/or crop yield. The research identified that different strategies were used and that a drought management typology comprising three types of drought management could be constructed: (i) technical (TDM) (ii) psycho-economic (PDM) and (iii) integrated (IDM). These three drought management approaches were discussed and recommendations made to improving drought mitigation and preparedness.

2.3 Innovation for information and market linkage services-

Hall (1986) suggests that innovations take two forms: product innovations and process innovations. The former involve the creation of new products or changes in the specification of existing goods and services sold in the market, either as products for final consumer demand or as products used as intermediate inputs within the supply chain. Process innovations involve changes in the way in which inputs are used in any given process of R&D, production, distribution and marketing. On the farm, innovations are mainly process innovations, whereas product innovation occurs primarily among suppliers of agricultural chemicals and equipment, etc.

Grover *et al.* (1991) Transfer of technology in the field of Agriculture, Veterinary, Home Science and Allied Sciences is a major objective of the Haryana Agricultural University (HAU) India. The main step in the transfer of technology (TOT) is the finalisation of the technical recommendations. Such recommendations for TOT in the field of Agriculture are prepared in the form of "package of practices". This study identifies and standardizes messages/sub-messages for Foods and Nutrition package along with testing the applicability of the messages as perceived by the field functionaries and the beneficiaries.

Eponou (1993) in addition to land, labour and capital, information on agricultural innovations is crucial to the development of agricultural production. Farmers receive information about innovations from a variety of sources, including their relatives, peer groups, suppliers and or extension agents. Despite their recognized contribution to yield increases and income growth, public extension services face important challenges in the areas of cost effectiveness, relevance, accountability, governance and sustainability.

Archibugi *et al.* (1994) this study is mainly concerned with innovation in economic context, specifically technological innovation. This is successful creation, development, and marketing of new goods or successful application of new techniques or ways of working that improves the effectiveness of an individual and organization.

Sugumar *et al.* (1994) have observed that 95 per cent of input dealers provide information to farmers based on their knowledge and experience gained through discussions with representatives of fertilizer or pesticide firms, and of these, 56 per cent were also found to consult extension workers. By providing information, input dealers try to earn goodwill of the farmers and to some extent are able to promote their business relationships with them.

Rajkumar and Hari Singh (2002) studied problems in vegetable production. The problems reported were, poor quality seeds (42.2%), insufficient availability of seed (40%), high cost of seed (31%) and non-availability of seed at appropriate time (12.2%). The other problems noticed were high cost of fertilizer, poor state of fertilizer and plant protection delivery system in the district. High wages and shortage of labour was also one of the constraints.

Sheriff (2003) the respondents are interested in getting information on fertilizers and pesticides, availability of good quality seeds, techniques of seed treatment and price details of paddy and banana during the harvest. The perused literature showed a clear idea of the increased computer usage in the developing countries especially in India. While exposing the rural people to this new avenue, the studies are noted to give an effective idea. In order to satisfy the objectives of the study, socio economic variables that would affect the knowledge gain and the skill

acquisition of the respondents are identified. Appropriate standard methodology was followed for the study.

Andrew Hall *et al*. (2003) the impact assessment research has not made more of a difference because the measurement of the economic impact has poor diagnostic power. In particular it fails to provide research managers with critical institutional lessons concerning ways of improving research and innovation as a process. The innovation systems framework is proposed as an approach where institutional learning is explicit. Three case studies of recent developments in international agricultural research are presented to illustrate these points. We conclude by suggesting that the innovation systems framework has much to offer research managers wishing to monitor and learn new ways of addressing goals such as poverty alleviation. The greatest challenge however, is that such holistic learning frameworks must contend for legitimacy if they are to complement the dominant paradigm of economic assessment.

Meera *et al.* (2004) A study was conducted that examined the performance of three ICT projects in india. The projects have quite different origins and purposes, but all are concerned with improving the delivery of information to farmers and other rural dwellers. The projects studied varied with respect to the type of services provided, including marketing information, extension advice, information about rural development programmes, and other information from government and private sources.

Ambili (2004) in a study conducted in Kerala on the users of the information systems in Kerala Agricultural University placed internet (95.24%) as the top priority while ranking preferred information sources to meet information needs.

James Sumberg (2005), the on-going evolution of the organisational architecture of agricultural research in Africa. Once considered a rural backwater populated by agronomists, extension agents and farmers, agricultural research is now being explicitly placed within global debates about innovation, technology, institutions and development. This is reflected in a growing interest in the use of systems of innovation theory to both understand and reform innovation processes within agriculture. It is suggested that a less directive approach to support for agricultural research is required to allow national characteristics and differences to

come to the fore, and to give more room for the development of the all important demand-side.

Chataway (2005) frame the issue in terms of institutional and systemic complexity, arguing that innovative capacity the capacity to apply new or existing knowledge to social and economic processes is the key issue in extending the reac and impact of pro-poor agbiotech beyond the laboratory.

Poulton *et al.* (2005) this suggests the importance of differentiating the diffusion of yield-enhancing and poverty reducing technologies by crop and commodity system. It can be argued that market structures and transactions costs associated with smallholder production of different commodity systems offer differing incentives to private investment in agbiotech research (and other rural services) beneficial to the smallholder. While structures and costs associated with traditional cash crop systems (e.g., cotton, coffee, and cocoa) may offer sufficient incentives to stimulate pro-poor agbiotech research from the private sector, the incentives are more constrained within high value commodity systems (e.g., horticulture, medicinals, and aromatics), and greatly constrained in food staple systems (e.g., rice, wheat, maize, sorghum, and millet).

Stuart Morriss *et al.* (2006) in policy and innovation systems characterized by fragmented institutional arrangements, communication between system participants can be problematic. Understanding the perspectives of system participants, and sources of agreement and disagreement between them, is critical for the development strategies for change requiring collective action. The policy systems analysis and mediation (PSAM) template has been developed as an analytical approach that facilitates a shared understanding between policy and innovation system participants and better enables collaborative strategies to be developed. The PSAM template, in augmenting existing analytical techniques, has particular value in facilitating the development of strategies for change in functionally differentiated and organizationally fragmented policy and innovation systems.

Agwu *et al.* (2008) a sustainable and dynamic approach to agricultural development has remained of great concern to the government and priority for discourse in the policy arena. Public research and extension institutions are projected as the sole source of innovation/knowledge requisite to trigger development in the

agricultural sector. Several other relevant macro economics and meso level factors such as policy and legislative framework and nature of human capital, physical infrastructure, finance and investment climate and system for facilitating information and knowledge flows were not considered as important. The emerging reforms and changes in knowledge structure of agriculture explicitly indicate that the traditional agricultural research and extension system alone cannot sufficiently address the challenges of the new trends. Innovation system approach offers a holistic and, multi-disciplinary approach to innovation and processes, incorporating emerging reforms and approaches for agricultural development.

P. Adhiguru *et al.* (2009) the study on agricultural information flow has revealed that only 40 per cent farm households access information from one or the other source. The popular information sources among farmers have been reported to be fellow progressive farmers and input dealers, followed by mass media. The public extension system has been found to be accessed by only 5.7 per cent households. Only 4.8 per cent of the small farmers have access to public extension workers as compared to 12.4 per cent of large farmers. The sector-wise study on the type of information, sought has revealed that a majority of the farmers have sought information on seed (32-55%) in the cultivation sector; on health care (26-54 %) in animal husbandry; and on management and marketing (8-46 %) in fisheries. Regarding adoption of information by farmers, input dealers and other progressive farmers have depicted greater influence mainly due to easy and convenient access to these sources. The study has suggested promotion of farmers-led extension and strengthening of public extension services to improve coverage and efficiency of agricultural information delivery systems.

Ali and Nupur (2009) suggested that create awareness among the producers and the consumers about organic farming by improving the level and quality of information through materials ranging from simple field training, media programs, leaflets, cell phone up to web sites and comprehensive campaigns.

Saravanan Raj (2010) the technological attributes wise perception of the clientele were alos documented. Further, this article make an attempt to review and analyse recent developments in sustainable farm technology delivery systems and reform measures such as; decentralization, privatization, demand driven and participatory approaches in farm technology delivery. Further, this article highlights

the innovations for sustainable technology dissemination and diffusion such as; farmer to farmer extension, single window extension delivery, integrated and broad based extension, gender specific extension, farmer participatory research and extension, validation, refinement and integration of indigenous knowledge systems with modern farm technology, self help group (SHG) approaches, grass root institutions, multi agency extension, market extension, environmental extension education, extension plus approaches, public-private-NGO partnerships and information and communication technology (ICT) initiatives.

Anirban Mukherjee *at al.* (2011) The present study was conducted in the private extension organisation, Tata Kisan Sansar (TKS) in Aligarh district of Uttar Pradesh. An ex-post facto research design was used for this study. The data was collected from 50 Tata Kisan Sansar member farmers. The effectiveness of the private organization in technology advisory and delivery services was measured by effectiveness index developed for this purpose. The study revealed that the extension services rendered by Tata Kisan Sansar were found to be medium in effectiveness by majority of the farmers (54 per cent). About 46 per cent of farmers found the extension service is highly effective. The extension services rendered by Tata Kisan Sansar were found to be medium in effectiveness by majority of the farmers (54 per cent) and 46 per cent of farmers found the extension service to be high in effectiveness. The Tata Kisan Sansar, the private initiative provides inputs, services, which is better in accessibility, quality and timeliness to the farmers. The constant advisory support in addition leads to better adoption of technologies which further leads to increase in yield and income and ultimately satisfaction of the farmers.

Tajdar Mohammad Qaisar *et al.* (2011) In recent years farmers attitude to access to agricultural information have been changed because of very fast networking of information and communication technology. Especially rural marketing exploring in a new ways as farmers access to marketing information. The objective of the study to evaluate different ICT projects running in India and to provide an overview of the types of services and projects that are in existence or being designed to disseminate information to Indian farmers in a new ways.

Chapter III

RESEARCH METHODOLOGY

This chapter deals with the description of study area, data base, sampling procedure, analytical framework, models, and explanation of important concepts related to study. The chapter is subdivided in to following sections.

3.1 Profile of the Madhya Pradesh State

3.2 Profile of Morena district

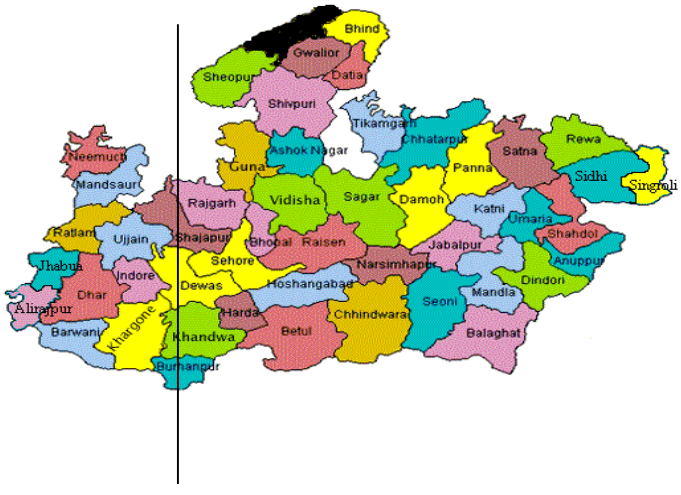
3.3 Description of study area

3.4 Data base and sampling design

3.5 Analytical fremework

3.1 Profile of the study aria

Madhya Pradesh, in its present form, came into existence on 1st November 2000 when a new state of Chhatisgarh was carved out of erstwhile state of M.P under the provisions of "Madhya Pradesh Reorganisation Act 2000". Madhya Pradesh came into existence with 45 districts. With creation of three new districts in 2002 and two districts in 2008, the total number of districts has become 50.



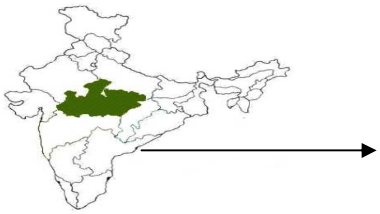
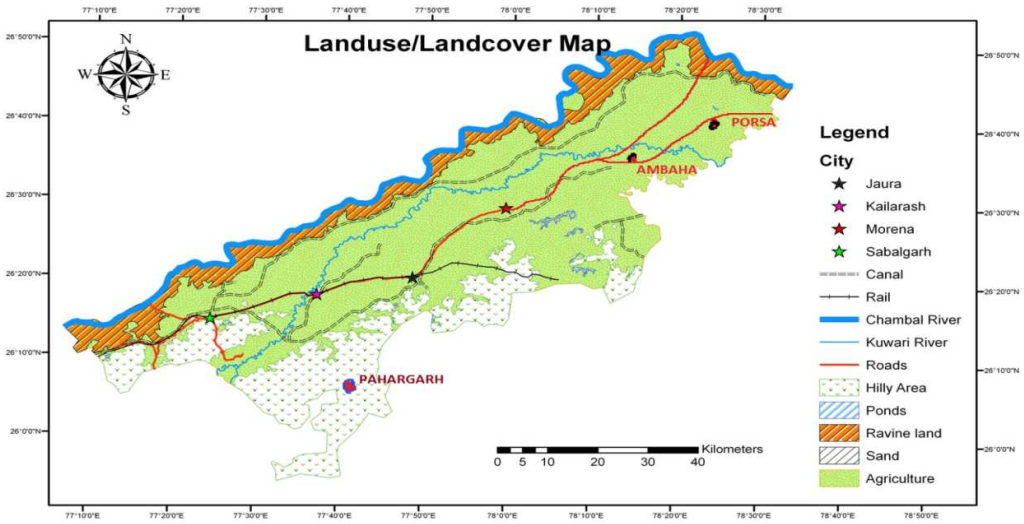


Fig. 1: Location of M.P. in India

Fig. 2: Location of Morena in M.P.

Fig. 3: Map of Morena District Showing Different Blocks



The state now has 10 Commissioner Divisions, 50 Districts, 342 Tehsils and 313 Community Development Blocks, including 89 tribal development blocks. Three-tier Panchayati Raj and Urban Local Bodies as the institutions of local self-governance were established and Madhya Pradesh was the first state to do so. The state, at present, has 50 Zila Panchayats (District level), 313 Janpad Panchayats (Block Level), 23040 Gram Panchayats (Village level) and 52117 inhabited villages. In urban habitations there are 14 Municipal Corporations, 96 Municipalities and 250 Nagar Panchayats.

Madhya Pradesh state is situated between 21°6’ to 26°30’ North latitude and 74°9’ to 81°48’ East longitude. Madhya Pradesh is situated in the centre of India. It is bordered by the states of Uttar Pradesh to the north,

Chhattisgarh to the east, Maharashtra to the south and Gujrat to the west and Rajasthan to the northwest. The border of Madhya Pradesh is not touch to the international border and border of sea.

Madhya Pradesh has a topography that is crossed from north to south by plains separated by upland areas. The climate of Madhya Pradesh state is monsoon type. Generally, there are three distinct seasons within a year viz. summer from March to June, rainy season from June to September with post monsoon rainfall in October and winter from October to March. During the winter average temperatures range from 10° to 27° C (50° to 81° F). Summers are hot, with an average temperature of 29° C (85° F) and a high temperature that at times reaches 48° C (118° F). During the monsoon season temperatures average 19° to 30° C (66° to 86°). Madhya Pradesh receives as average annual rainfall of about 1200 mm (nearly 50 in), of which 90 percent falls during the monsoon season. The capital of the state is Bhopal.

The State is primarily an agriculture State. About 73% population of the state is rural, which is directly or indirectly depends on agriculture. Thus Agriculture Sector is the main Stay of the State economy. The Agriculture and allied services contributes about 44% share in state economy and 78% of its working force is directly engaged in Agriculture. Thus Agriculture sector forms the backbone of MP economy. Madhya Pradesh government has resolved to establish Agriculture Cabinet and present a separate Agriculture Budget in the next budget session 2014-15. Madhya Pradesh will become the first state in the country to do so. The share of agriculture sector in Madhya Pradesh State Gross Domestic Product (SGDP) was 22.47 percent in year 20012-13. The State's economy is agriculture-based and economic activities are

connected with industries and service sector. The report of Agriculture Economic Survey will turn out to be a milestone in this connection.

The agriculture sector growth rate in Madhya Pradesh was 7.53 per cent in 2009-10. The State Government is committed to making agriculture profitable. With total agriculture sector growth in view, production and development will be augmented in allied sectors like horticulture, farm forestry and forest produce, animal husbandry and dairy development and fishers.

3.2 Profile of the Morena District

Morena district is one of the 50 districts of the central Indian state of Madhya Pradesh. The name, Morena is derived from the mor + raina means the place where peacock is enormously found. Morena has an identity of being home to perhaps the largest number of peacocks in the India. It is located between 25°15' to 26°53' north latitude and 76°10' to 78°38' east longitude. The district is part of Chambal Division. District Map highlights the name and location of all the districts in Madhya Pradesh. Morena is one of the northern most districts of Madhya Pradesh and part of the great Chambal area. Morena touches Dholpur (Rajasthan) in North-West and Pinahat (Agra, Uttar Pradesh) in North-East. The neighbouring districts are Bhind, Gwalior, Shivpuri and Sheopur. With Morena town as the headquarters, the district has a total area of 4998.78 square kilometers and a population of 1965.137 thousands. Morena is fifth district in state in density of population (394 /km^2 or 1,020 /sq mile) after Bhopal, Indore, Jabalpur and Gwalior. Morena has great potential as a tourist destination and one can find many places of interest to visit. The National Chambal Sanctuary, the Fort of Sabalgarh and Kutwar are few examples of such exciting spots.

Morena is the Gird zone of Madhya Pradesh state. Morena is located on the north region in Madhya Pradesh state of India. The hill area in the west region of Morena and Chambal revines in the north region of Morena district. The annual rainfall is about 750-900mm. The region has hot and humid climate. The soil of the region is mainly of two types one allubial soil in most of northern part while medium black soil in western part. Agriculture is the main source of occupation with mustard and wheat being the most important agricultural products. The major occupations

areagriculture, horticulture, livestock, poultry etc. and other crops grown are wheat, mustard, gram, jowar, mung, urd, soyabean, sugarcane, til etc. Morena is famous for its mustard production.

3.3 Description of the Study Area

The present study was undertaken in Morena region which lies at North part of the state and falls under low rainfall with alluvial soil Agroclimatic Zone (zone-II). The geographical area of Morena region is 4998.78 sq km. It comprises 7 blocks namely Sabalgarh, Kailaras, Pahargarh, Joura, Morena, Ambah and Porsa.

3.3.1 Climate, Rainfall and Soil Type

Climatic conditions in the region are strongly influenced by its geographical conditions and climate of Morena is mansoon type and warm climate. The humidity of the region ranges from 55 to 85 per cent throughout the year. On an average, temperature ranges from 15^0C to 47^0C. Rainfall is most dominant single weather parameter that influences plant growth and crop production because of uncertainty and variable nature. The region gets assured rainfall of 750 to 1100 mm. from south-west monsoon during the months from June to September. The south-west monsoon commences by end of June and it sojourns till the end of September. There are three distinguishable agricultural seasons in the study area, viz., kharif (June to October), rabi (October to March) and summer (March to June). The soils of Morena district are alluvial soil and medium black soil.

3.4 Database and Sampling Design

Data required for the present study were obtained from primary data. Primary data was collected from farmers by direct interview method with well structured, pre tested schedule prepared exclusively for this study. Multistage sampling method was used to select sample households.

3.4.1 Selection of State

The present study will confine to Madhya pradesh State, because it has maximum diversified area under in agriculture.

3.4.2 Selection of District

Morena district will be select purposively for the present study. This district is covered almost all area under agro climatic zone VIII central plateau & hill region (2) Gird zone to alluvial soil with 75 cm to 90 cm rainfall area. It is so because Morena district is the one of the agricultural diversified area of Madhya Pradesh state and farmers are using agriculture technologies in large scale to cope up the situation. The Morena district was purposively excluded from study as it is a rural area and contains less agricultural land. This district is divided in to seven blocks like Sabalgarh, Kailaras, Pahargarh, Joura, Morena, Ambah and Porsa.

3.4.3 Selection of Block

Out of 7 blocks, one Block (Kailaras) was selected purposively on the basis of maximum area in different types of farming system. The data regarding area under different crops such as cereals, pulses, plantation crops, forest, rainfall, livestock animal poultry birds etc., were collected for all blocks of both the district. Based on these parameters the blocks were subjected to Stratified Multistage analysis.

The technique and procedure of Stratified Multistage analysis is described later in this chapter. Out of Sabalgarh, Kailaras, Pahargarh, Joura, Morena, Ambah, Porsa seven blocks, randomly select the Kailaras block and this area is maximum diversified area under in agriculture sector.

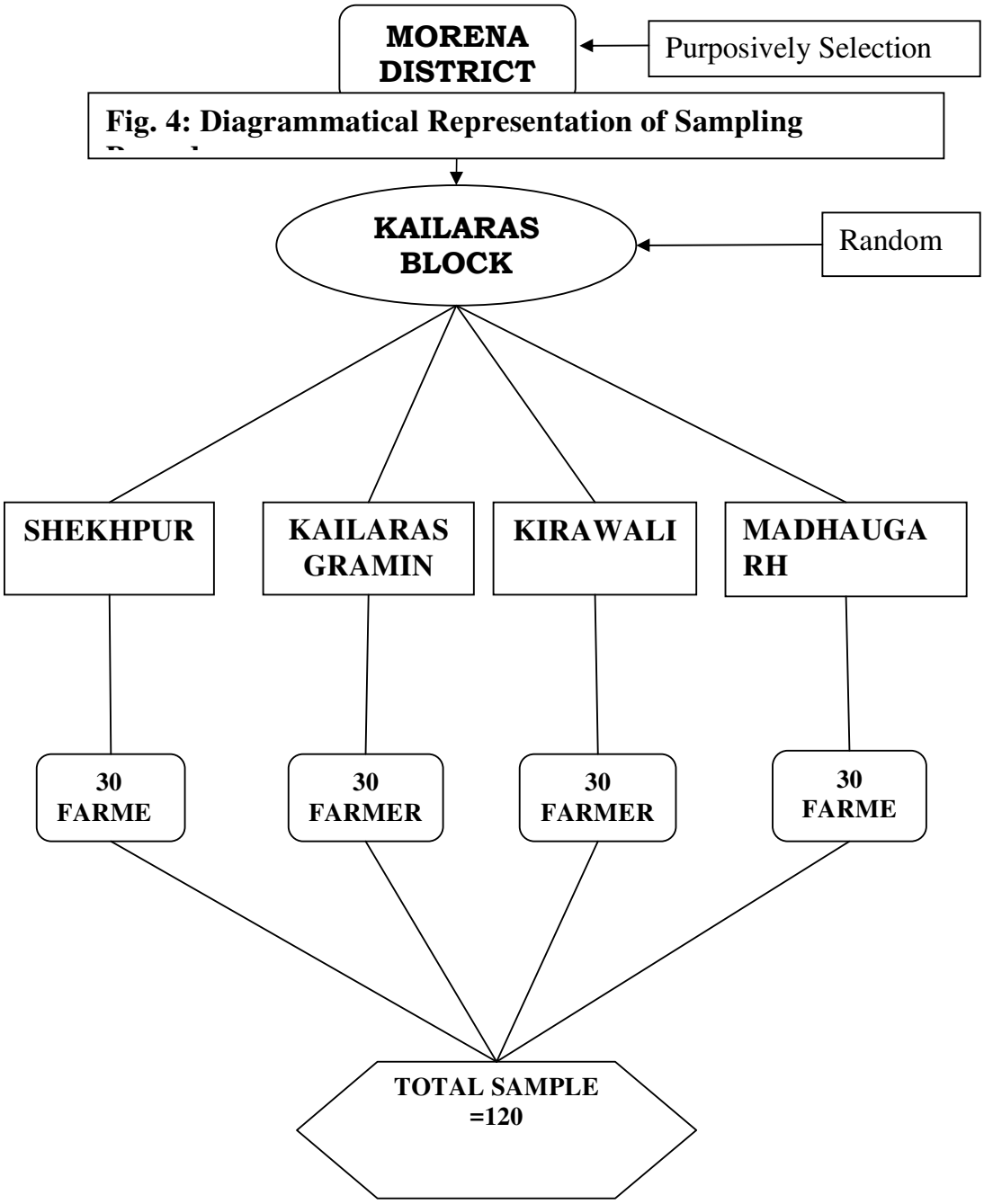


Fig. 4: Diagrammatical Representation of Sampling

3.4.4 Selection of Village

Simple random sampling procedure was followed for selection of sample villages. The list of total village was prepared with the help of BDO / ADO and four villages were randomly selected out of all villages of Kailaras block. Total 106 villages are considered in the Kailaras block. I was selected the four villages like Kailaras gramin, Kirawali, Shekhpur and Madhougarh villages from the 106 villages of all Kailaras block. It villages are located in different regions of Kailaras block. These villages were selected purposively on the basis of maximum area in different types of farming system and maximum agriculture diversified area in these villages.

3.4.5 Selection of Households

The proportionate sampling was followed to decide the share of total number of sample households for a particular block. An attempt was made to select around 30 farmers from each Village and to distribute the sample households per village equally. The total 120 farmers were selected from all selected villages, comprising 30 farmers for each village. In the total sample includes the small farmers (1 to 2 ha), medium farmers (2 to 4 ha) and large farmers (above 4 ha) were part of study as sample. The total number of sample farm holdings per village were decided on the basis of contribution of a particular village in a respective based on area under different crops such as cereals, pulses, plantation crops, forest, rainfall, livestock animals, poultry birds etc.

3.5 Analytical framework

(A) For Agricultural diversification:

1. Diversification index:

$$\mathbf{Di = 1- \frac{\Sigma(si)^2}{\Sigma(s)^2}}$$

Where,

Di is Diversification index

Si is share of net income of the i^{th} enterprise per farm net income

S is per farm net income of a farming system

2. Simpson index:

$$SID = 1 - \sum_{i=1}^{n} Wi$$

Where,

$$Wi = \frac{Xi}{\Sigma Xi}$$

Xi is the area of the i^{th} crop

Wi is the proportionate area of the i^{th} crop in the total cropped area

The results of the study and relevant discussion are presented under the following sections in accordance with the objectives for the study.

4.1 analysis of Agricultural diversification

4.2 strategy for minimization the risk in agriculture

4.3 seek suggestion for information delivery and market linkage services

4.1 Economic analysis of Agricultural diversification

Agricultural diversification is a widely advocated means for agricultural and rural development. Agricultural diversification is a concept, which is opposite to crop specialization. It implies shift from single crop farming to multiple crop farming, from subsistence farming to commercial farming from low value food crops to high value food or non-food crops or from crops with livestock and poultry. The level of agricultural diversification largely depends upon the agro climatic/ socio-economic condition and technological development in the region. In general, it is presumed that higher the level of agricultural technology, lesser the degrees of diversification. As agriculture in less developed region is more dependent upon nature, the risk of crop loss is very high. In the areas where the variability of rainfall is high and adequate sources of irrigation are not available, farmers grow several crops in a season to get something from their fields in case of extreme weather and rear animals. Further, diversification is also considered essential to reap scale economies arising out of complementary and supplementary enterprises. The diversification of crops also generate more employment as the farmers and agricultural workers remain busy in the sowing, weeding, harvesting and marketing of different crops and poultry throughout the year.

To study the extent of diversification, various methods are available in the literature. The most commonly used methods are Diversification index, Theils entropy index, Herphindal index and Simpson index:

Diversification index is defined as:

$$\mathbf{Di = 1- \frac{\Sigma(si)^2}{\Sigma(s)^2}}$$

Where,

Di is Diversification index

Si is share of net income of the i^{th} enterprise per farm net income

S is per farm net income of a farming system

The value of Diversification index varies between zero to one. It is zero in case of perfect specialization and one in case of perfect diversification.

Simpson index is defined as:

$$\boldsymbol{SID = 1 - \sum_{i=1}^{n} Wi}$$

Where,

$$\boldsymbol{Wi = \frac{Xi}{\Sigma Xi}}$$

Xi is the area of the i^{th} crop

Wi is the proportionate area of the i^{th} crop in the total cropped area

The value of Simpson index varies from zero to one. When there is perfect specialization SID takes the value of zero and when there is perfect diversification SID takes the value of one.

Table no: 1- Value of different index:

N = 120

S.No.	Diversification Index (D.I.)	Simpson Index (S.I.)
1	0.229	0.992
2	0.18	0.893
3	0.9	0.787
4	0.467	0.167
5	0.28	0.871
6	0.35	0.890
7	0.566	0.976
8	0.46	0.479
9	0.234	0.83
10	0.2	0.923
11	0.179	0.945
12	0.38	0.329
13	0.235	0.93
14	0.753	0.932
15	0.274	0.789
16	o.21	0.231
17	0.099	0.679
18	0.671	0.594
19	0.121	0.637
20	0.64	0.959
21	0.14	0.435
22	0.035	0.72

23	0.029	0.709
24	0.030	0.729
25	0.768	0.992
26	0.012	0.684
27	0.033	0.875
28	0.39	0.659
29	0.20	0.684
30	0.26	0.988
S. No.	**Diversification Index (D.I.)**	**Simpson Index (S.I.)**
31	0.957	0.891
32	0.814	.799
33	0.674	0.992
34	0	0.184
35	0.047	0.789
36	0.4	0.376
37	0	0.392
38	0.328	0.892
39	0.1	0.987
40	0	0.995
41	0.969	0.897
42	0.007	0.789
43	0.006	0.989
44	0.088	0.971
45	0	0.792
46	0.418	0.826

47	0.5	0.395
48	0.515	0.987
49	0.066	0.617
50	0	0.997
51	0.071	0.818
52	0	0.628
53	0.035	0.879
54	0.018	0.782
55	0.7	0.432
56	0.137	0.689
57	0.001	0.286
58	0.623	0.929
59	0.011	0.867
60	0.293	0.781
61	0.271	0.687
S. No.	**Diversification Index (D.I.)**	**Simpson Index (S.I.)**
62	0.157	0.895
63	0.123	0.782
64	0.081	0.579
65	0.327	0.93
66	o.815	0.723
67	0.446	0.926
68	0.671	0.797
69	0.58	0.682
70	0.888	0.797

71	0.955	0.994
72	0.2	0.721
73	0.331	0.613
74	0.1	0.896
75	0.017	0.379
76	0.058	0.829
77	0.666	0.291
78	0	0.872
79	0.65	0.984
80	0.59	0.89
81	0.12	0.313
82	0.813	0.692
83	0.54	0.689
84	0.452	0.894
85	0.161	0.849
86	0.276	0.99
87	0	0.785
88	0.019	0.416
90	0.409	0.994
91	0.524	0.978
92	0.8	0.832
93	0.022	0.892
94	0.5	0.895
S. No.	**Diversification Index (D.I.)**	**Simpson Index (S.I.)**
95	0.033	0.984

96	0.048	0.823
97	0	0.995
98	0.038	0.630
99	0.048	0.44
100	0.3	0.813
101	0.246	0.687
102	0	0.996
103	0.016	0.823
104	0.30	0.698
105	0.11	0.874
106	0.072	0.921
107	0.2	0.877
108	0	0.793
109	0.082	0.987
110	0.036	0.763
111	0.1	0.627
112	0.027	0.644
113	0	0.813
114	0.058	0.95
115	0.017	0.983
116	0.068	0.82
117	0	0.987
118	0.027	0.788
119	0.047	0.821
120	0	0.89

In Diversification index (D.I.) from table no. 1, it is evident that, 90 (75%) farmers out of total study farmers, they are having Diversification index is less than 0.5 which shows that they are have less diversification or more specialization and 30 (25%) farmers out of total study farmers are having Diversification index is more than 0.5 which shows that they have more diversification or less specialization. 13 (10.83%) farmers are having diversification index value is zero, which shows that they are having perfect specialization or no diversification. It means they are growing only agriculture crops on the farm. 69 (57.5%) farmers out of total study farmers are having Diversification index value is between 0.01 to 0.09, which shows that they are having more specialization, means they are growing horticultural crops along with agricultural crops. 11 (9.16%) farmers out of total stud farmers are having Diversification index value is between 0.1 to 0.2, which shows that they are having specialized, means they are farming of poultry and horticultural crops along with agricultural crops on his farm. 12 (10%) farmers out of total study farmers are having Diversification index value is between 0.3 to 0.5, which shows that they are having less specialization or more diversification, means they are farming of livestock and horticultural crops along with agricultural crops on the farm. 17 (14.16%) farmers out of total study farmers are having Diversification index value is between 0.6 to more than 0.6, which shows that they are having highly diversified, means they are farming of livestock, poultry, business and horticultural crops etc. along with agricultural crops on his farm.

In Simpson index (S.I.) from table no. 1, it is evident that, 19 (13.83%) farmers out of total study farmers, they are having Simpson index value is less than 0.59 which shows that they are have less diversification or more specialization and 100 (83.33%) farmers out of total study farmers are having Simpson index value is more than 0.6 which shows that they have more diversification or less specialization. 24 (20%) farmers are having Simpson index values are 0.167 and 0.184, which shows that they are having highly specialization or no diversification. It means he is growing only agriculture crops on the farm. 3 (2.5%) farmers out of total study farmers are having Simpson index value is between 0.2 to 0.3, which shows that they are having more specialization, means they are growing horticultural crops along with agricultural crops. 5 (6.25%) farmers out of total stud farmers are having Simpson index value is between 0.4 to 0.5, which shows that they are having specialized,

means they are farming of poultry and horticultural crops along with agricultural crops on his farm. 35 (29.10%) farmers out of total study farmers are having Simpson index value is between 0.6 to 0.8, which shows that they are having less specialization or more diversification, means they are farming of livestock and horticultural crops along with agricultural crops on the farm. 31 (25.85%) farmers out of total study farmers are having Simpson index value is more than 0.9, which shows that they are having highly diversified, means they are farming of livestock, poultry, business and horticultural crops etc. along with agricultural crops on his farm.

4.2 Risk coping strategy of farmers in agriculture

A survey which is conducted revealed that the farmers were adopting many risk coping strategy in different situations. These strategy are shown below

(1) During the problem of flood:

N=120

S. No.	Strategy	Percentage
(a)	No cropping in flooding season	14.25%
(b)	Growing of another crop	51.25%
(c)	Ploughing of crop which is not usefull in field	32.50 %
(d)	Total	100%

During the problem of flood, the farmers adopt different practices like, 14.75 % of total study farmers expressed that they are not growing any crop during flooding period, 51.75 % of total study farmers adopting another crop after the flood situation comes under control and 32.5 % of total study farmers told that they are ploughing the crop which is damaged by flood, which can be used for next season/ further for manuring and composting.

(2) During the problem of drought:

N=120

S. No.	Strategy	Percentage
(a)	Alternate occupation like livestock on farm	43.25 %
(b)	Migrate to city for work	20.50 %
(c)	Labour work	21 %
(d)	Growing of fodder crop which require less water	15.25 %
(e)	Total	100%

During the problem of drought situation, farmers adopt different practices like, 43.25 % of total study farmers expressed that they are shift to another occupation/ alternate occupation which is possible on that farm like livestock etc., 20.5 % of total study farmers told that they migrate to another place like city for work to earn for their family basic needs, 21 % of total study farmers expressed that during drought situation farmers work as labour for their basic needs and 15.25 % of total study farmers told that during drought condition farmers grow fodder crops like jowar, which require less water for crop growth.

(3) During the problem of any crop season insects/pests attack:

N=120

S. No.	Strategy	Percentage
(a)	Not growing any crop during infestation period	13 %
(b)	growing another crop which is not being infested	40.75 %
(c)	Using the affected crop for fodder purpose for animals	18.75 %
(d)	Ploughing of infested crop on field	27.50 %
(e)	Total	100%

During the problem of any crop season insects/ pests attack and it result loss of crop then farmers adopt different practices like, 13 % of total study farmers told that they are not growing any crop during infestation period, 40.75 % of total study farmers expressed that they are growing another crop which can not be infected/ infested by with those insects/ pests, 18.75 % of total study farmers expressed they are using the affected crop for fodder purpose for animals and 27.5 % of total study farmers told that they are ploughing the crop which is affected by insects/ pests attack, which can be used further/ for next season for manuring and composting.

(4) During the problem of hails appear during crop season:

N=120

S. No.	Strategy	Percentage
(a)	No cropping in this season	14.50 %
(b)	Growing of crops which short duration	51 %
(c)	using the damaged crop for fodder purpose for animals	9 %
(d)	Ploughing the crop on field which is damage by hails	25.50 %
(e)	Total	100%

During the problem of hails appear during crop season then farmers adopt different practices like, 14.5 % of total study farmers told that they are not growing any crop in this season, 51 % of total study farmers expressed that they are growing of crops which short duration for utilization of short time between two season, 9 % of total study farmers told that they are using the damaged crop for fodder purpose for animals and 25.5 % of total study farmers expressed that they are ploughing the crop on field which is damage by hails, which can be used for next season for manuring and composting.

(5) During the problem of water scarcity period:

N=120

S. No.	Strategy	Percentage
(a)	No cropping in this season	20.25 %
(b)	Growing fodder crop	19.25 %
(c)	Irrigation by tube-well	60.50 %
(d)	Total	100%

During water scarcity period, farmers adopt different measures like, 20.25 % of total study farmers told that they are not growing any crop during water scarcity period, 19.25 % of total study farmers expressed that they are growing crops which

require less water for their growth period like fodder crops and 60.5 % of total study farmers told that they are using tube-well for irrigation purpose for growing crops.

(6) During harvest period, farmers faced transportation problem:

N=120

S. No.	Strategy	Percentage
(a)	Selling the produce at low price in his village	55.50 %
(b)	Storage of crop produce	44.50 %
(c)	Total	100%

During harvest period, farmers faced transportation problem then farmers takes different measures like, 55.5 % of total study farmers expressed that they are selling the produce at low price for village traders and 44.5 % of total study farmers told that instead of selling the produce, they store the crop produce.

(7) During the problem of market price:

N=120

S. No.	Strategy	Percentage
(a)	Selling the low price	75 %
(b)	Take the produce back at home	25 %
(c)	Total	100%

During the problem of after reaching to market, if farmers do not get the expected price then farmers adopt different measures like, 75 % of total study farmers expressed that they are selling the produce at low price and 25 % of total study farmers told when they are not getting expected price then they bring back the produce to home.

(8) During the problem of the period of storage:

N=120

S. No.	Strategy	Percentage
(a)	Affected produce is used for animals	35.75 %
(b)	Selling the low price	54.25 %
(c)	Selling the produce by making grading	10 %
(D)	Total	100%

During the problem of the period of storage of produce if any factors (insect/pest etc.) damage to produce then farmers takes different measures like, 35.75 % of total study farmers expressed that they use the affected produce for animals for feeding purpose, 54.25 % of total study farmers expressed that are selling their affected produce at low price and 10 % of total study farmers told that they are do grading of their produce, than they sell the grading produce at different prices.

4.3 Suggesting for information delivery and market linkage services

Today's time farmers are using mixed farming, they rear livestock, poultry along with crops and the major problem for growing crops and rearing livestock is about new technology, which farmers are facing. If farmers get information about new technologies then they may increase their crop production and productivity. They may earn more income from livestock and poultry.

As our survey revealed that farmers are using new technologies which are described below

(1) Information about new variety:

N=120

S. No.	Strategy	Percentage
(a)	News paper	12.75 %
(b)	KVK / REO	22.25 %
(c)	Other Farmers/ Shop	65 %
(d)	Total	100%

12.75 % farmers of total study farmers told that they are getting new information about new varieties from news paper, 22.25 % farmers of total study farmers told that they are getting new information about new varieties from KVK and 65 % farmers of total study farmers told that they are getting new information about new varieties from other farmers & shop.

(2) Information about new technology:

N=120

S. No.	Strategy	Percentage
(a)	Other farmers	25.25 %
(b)	KVK / Farmer seminar	44.75 %
(c)	Market / shop	14.50 %
(d)	TV / radio	15.50 %
(e)	Total	100%

25.25 % farmers of total study farmers told that they are getting new information about new technologies from other farmers, 44.75 % farmers of total

study farmers told that they are getting new information about new technologies from KVK & farmer seminar and 14.50 % farmers of total study farmers expressed that they are getting new information about new technologies from other market & shop and 15.50 % farmers of total study farmers expressed that they are getting new information about new technologies from TV & Radio.

(3) Information about market price:

N=120

S. No.	Strategy	Percentage
(a)	Shopkeeper	56.25 %
(b)	Market / Mandi	20 %
(c)	News paper	23.75 %

56.25 % farmers of total study farmers expressed that they are getting new information about market price from shopkeeper, 20 % farmers of total study farmers told that they are getting new information about market price from market & mandi and 23.75 % farmers of total study farmers expressed that they are getting new information about market price from news paper.

Market linkage services:

(1) Linkage for cereals:

(a) Farmer to consumers
(b) Farmer to retailer or village trader to consumer
(c) Farmer to wholesaler to retailer to consumer
(d) Farmer to village trader to wholesaler to retailer
(e) Farmer to cooperative marketing society

(2) Linkage for oilseed:

(a) Producer to consumer

(b) Producer to village trader to processor to oil retailer to consumer

(c) producer to oilseed wholesaler to processor to oil wholesaler to oil retailer to oil consumer

(d) Producer to government agency to oil wholesaler to consumer

(3) linkage for pulses:

(a) Producer to consumer

(b) Producer to village trader to processor to retailer to consumer

(c) Producer to wholesaler to processor to wholesaler to oil retailer to oil consumer

(d) Producer to government agency to oil wholesaler to consumer

Chapter V

SUMMARY AND CONCLUSION

5.1 Introduction

Agricultural diversification can be described in terms of the shift from the regional dominance of one crop towards the production of a large number of crops to meet the increasing demand of those crops. It can also be described as the economic development of non agricultural activities. Agricultural diversification either take the form of shift from subsistence farming to commercial farming or the shift from low value food crops to high value crops. The diversification of agriculture towards non-food-grain and high value commodities has been the right answer for it, because these commodities have potential of income augmentation, employment generation, poverty alleviation and export promotion. Traditionally, diversification was used more in the context of a subsistence kind of farming, where in farmers grow many crops on their farm. In economics, diversification refers to a situation in which decrease in the dominance of an activity, alternately increase in the share of many activities in a system is depicted. With this background in mind the study has been planned with the following specific objectives.

1. To study the analysis of Agricultural diversification

2. To analyze the strategy for minimization the risk in agriculture of farmers

3. To seek suggestion for information delivery and market linkage services

Hypothesis of following study

1. Diversification does not reduce risk in Agriculture

2. Risk coping strategies are mainly include crop and enterprise diversification

5.2 Methodology

Data for the present study were obtained from primary data collection. Primary data was collected from farmers by direct interview method with well structured, pre tested schedule prepared exclusively for this study. The Kailaras block of Morena district selected by multistage sampling method than four villages selected out of 106 villages of Kailaras block and a sample size of 120 farmers was selected by applying stratified random sampling technique. Data was collected through direct interview method with well structured, pre-tested schedule. Collected data were tabulated and

analyzed in the light of the objectives of the study using different index like Diversification index, and Simpson index.

5.3 Major findings

5.3.1 Economic Analysis of Agricultural Diversification

According to Diversification index, 13.75 % farmers are having diversification index value is zero, which shows that they are having perfect specialization or no diversification, means they are growing only agriculture crops on the farm and 16.25 % farmers out of total study farmers are having shows that they are having highly diversified, means they are farming of livestock, poultry, business and horticultural crops etc. along with agricultural crops on his farm.

According to Simpson index, 6.25 % farmers out of total study are shows that they are having more specialization or less diversification, means he is growing only agriculture crops on the farm and 45 % farmers are shows that they are having highly diversified, means they are farming of livestock, poultry, business and horticultural crops etc. along with agricultural crops on his farm.

5.3.2 Risk Coping Strategy of Farmers in Agriculture

1. During flood condition, farmers are adopting measures like, growing of another crops and ploughing of crop which is not usefull.

2. During drought problem, farmers are adopting measures like, alternate occupation; migrate to city for work and growing fodder crops which require less water.

3. During the problem of insects/ pests attack, farmers are adopting measures like, growing of another crop which is not being infested and use for fodder purpose the infected crop.

4. If hails appear during crop season then farmers are adopting measures like, ploughing of crop on the field and growing of crops which are short duration.

5. During the problem of water scarcity period, farmers are adopting measures like, irrigation by tube-well.

6. During harvest period, the problem of transportation then farmers are adopting measures like, selling the produce at low price to village traders and store of crops at home.

7. During the problem of the period of storage, if any factors (insect-pest) damage to produce then farmers are adopting measures like, affected produce is used for animals and they are do grading of their produce, than they sell the grading produce at different prices.

5.3.3 Suggestion for Information Delivery and Market Linkage Services

1. The farmers are getting new information about new varieties from news paper, KVK, Kisan Call Centre and other farmers.

2. The farmers are getting new information about new technology from farmer seminar, ot.her farmers and TV/ Radio.

3. The farmers are getting information about market price from shopkeeper, other farmers, mandi and news paper.

5.3.4 Suggested Areas for Future research

1. This study was limited to only one block. A study should be more than one block so that finding can be generalized for larger area.

2. A comparative study can be done to get income from different occupation of farming system.

3. A comparative study can be done of agricultural diversification of more than one district, blocks, villages and other different selected areas.

4. Our study can be used to develop new machinery which perform more than one agricultural operation, develop new varieties hybrids which give more yield, develop new technologies which require less time and give more efficiency.

5.3.5 CONCLUSION

This study analyzed the trends and patterns of agricultural diversification and related development in different selected areas, considering various agro-climatic, socio-economic, technological, infrastructural, institutional and policy factors, to analyse the various economic aspects including production, profitability, equity and viability of small and marginal farms in the context of diversification and lastly to identify within the agriculture & allied activities sectors. The share of agriculture including livestock was highest (77.5%), the share of poultry is 6.75%, the share of Horticulture crops is 40% in farming system in Morena District of Madhya Pradesh and suggested appropriate strategies and policies for accelerated and diversified agricultural growth as well as sustainability of small/marginal farms in these region. Our study identified the most prevalent risks facing agricultural households, their risk attitudes, the risk management strategies they employ and the role of off-farm investments in farm household risk management. Maximum agricultural households (59%) reported that drought risk was the most serious and other risk viz. flooding, insect pest attack, marketing and storage risk which were facing by farmers were less prevalent. The farmers get information about new technologies, new variety and market price through news paper, KVK, farmer seminar, market and other farmers.

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APPENDIX

Survey Schedule
For
A Study of Agricultural Diversification in Morena District of Madhya Pradesh

Date: ..... **Schedule No……**

1.0 General information

1.1 Village ……. Tehsil…… Block …….....

2.0 Farmers name : …… **Age (year): ……**

2.1 Educational status: …… **Farming Experience (Year):…**

3.0 Occupation

Agriculture	Livestock	Poultry	Fisheries	Business	Service	Others

4.0 Family Size: Small /Medium /Large
Male……. Female……. Total……..

S. No.	Name	Education	Age	Occupation (If agri. In mandays)	Average income/annum
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Illiterate [1]; Primary [2]; Secondary [3]; High school [4]; Intermediate [5]; Graduate [6]; Post graduate [7]; Professional [8]

5.0 Farm inventory position
a. Land inventory

S. No	Particulars	Dryland (Bigha)	Land value /Rent	Irrigated (Bigha)	Land value /Rent	Total (Bigha)
1.	Area owned					
2.	Leased in					
3.	Leased out					
4.	Fallow land					

b. Farm buildings

S. No.	Items	Year of construction	Construction cost (Rs.)	Present value (Rs.)
1.	Dwelling house			
2.	Farm house			
3.	Cattle shed			
4.	Poultry shed			
5.	Pump shed			
6.	Storage house			
7.	Others, if any (specify)			

c. Farm machinery and equipments:

1)…… 2)……. 3)……

d. Livestock/animal husbandry

S. No	**Animals**	**Number**	**Year of purchase**	**Purchase value(Rs.)**	**Current value(Rs.)**
1.	Dairy cows				
	i. Local				
	ii. Crossbred				
2.	Buffaloes				
	i. Local				
	ii. Crossbred				
3.	Bullock pair				
4.	Calves				
5.	Poultry				
	i.				

	ii.				
	iii.				
6.	Sheep				
7.	Goat				
8.	Pig				
9.	Fish				
	i. Tank				
	ii. Farm pond				
10.	Others (specify)				

6.0. Cropping pattern
Annual crops

Season		**Major Crop**	**Irrigated (Bigha)**	**Dryland (Bigha)**	**Total (Bigha)**	**Output**		**Input(Rs.)**	**Value (Rs.)**
						MP (q/bigha)	BP (q/bigha)		
Kharif	**1**								
	2								
	3								
	4								
	5								
Rabi	1								
	2								
	3								
	4								
	5								
Summer	1								
	2								
	3								
Biseason	1								
	2								
	3								
Hort.crops	1								
	2								
	3								
	4								

MP-Main product, BP-By product

7.0. Sources of irrigation

S. No	Sources	Maximum area can be irrigated (Bigha)	Actual area irrigated (Bigha)	Cost of irrigation (Rs)	Remarks
1.	Tank				
2.	Canal				
3.	Open well				
4.	Tube well				
5.	Others specify				
6.	Total area irrigated				

8.0 Livestock production

S	Animal	Number	Production (kg/year)			Value (Rs.)
			Milk	Meat	Wool	
1.	Cattle					
2.	Buffalo					
3.	Goat					
4.	Sheep					
5.	Pig					
Total						

9.0 Poultry production

S. No	Bird	Number	Production		Value (Rs.)
			Meat (kg/year)	Egg (nos./year)	
1.	Hen				
2.	Duck				
Total					

10.0 Fish production

Production (kg/year)…… Income (Rs/year)……..

11.0. Sources of fund

(i) Owned (Rs)… ……. (ii) Borrowed (Rs)……

If borrowed, what are the sources of credit?

S. No.	Sources of credit	Amount of loan (Rs)	Interest rate (%)	Year of loan obtaine	Repayment made (Rs)	Outstanding amount (Rs)	Remarl
1.							
2.							
3.							
4.							
5.							

12.0 Total Labour Use

12.1 Total Labour Use in Agriculture Production

Kharif											
No. of Operatin	Human Labour						Bullock labour		Tractor / Machine		Total amount
	Hired		Family		Rate (Rs/day)		Hours	Rate (Rs/day)	Hours	Rate (Rs/Hr)	
	M	F	M	F	M	F					

Rabi											Total amount
No. of Operatin	Human Labour						Bullock labour		Tractor / Machine		
	Hired		Family		Rate (Rs/day)		Hours	Rate (Rs/day)	Hours	Rate (Rs/Hr)	
	M	F	M	F	M	F					

Zaid											Total amount
No. of Operatin	Human Labour						Bullock labour		Tractor / Machine		
	Hired		Family		Rate (Rs/day)		Hours	Rate (Rs/day)	Hours	Rate (Rs/Hr)	
	M	F	M	F	M	F					

12.2 Total Labour Use in Livestock Production

No. of Operatin	Human Labour						Bullock labour		Tractor / Machine		Total amount
	Hired		Family		Rate (Rs/day)		Hours	Rate (Rs/day)	Hours	Rate (Rs/Hr)	
	M	F	M	F	M	F					

12.3 Total Labour Use in Poultry Production

No. of Operatin	Human Labour						Machine		Total amount
	Hired		Family		Rate (Rs/day)		Hours	Rate (Rs/Hr)	
	M	F	M	F	M	F			

12.4 Total Labour Use in Fish Production

No. of Operatin	Human Labour						Machine		Total amount
	Hired		Family		Rate (Rs/day)		Hours	Rate (Rs/Hr)	
	M	F	M	F	M	F			

13.0 Total input & output

S. No.	**Particulars**	**Total Input**	**Total Output**	**Net profit(Per year)**
1.	Agriculture Production			
2.	Livestock Production			
3.	Poultry Production			
4.	Fish Production			
5.	Others			

14.0 Risk coping strategy:

14.1 If you not get the required amount to grow crop when you are needed, then what do you do?

(i)……

(ii)……...

14.2When flood comes, what do you do?

(i)……..

(ii)……

14.3 When drought comes, what do you do?

(i)……

(ii)……..

14.4 If in any crop season insects, pests attack is there, and it results loss of your crop then what alternative do you have?

(i)……

(ii)……..

14.5 If hails appear during crop season then what measure taken by you?

(i)……

(ii)……...

14.6 If water availability is not there in canal which is near to your field in any season, how do you manage?

(i)……

(ii)……...

14.7 If you do not have any transportation facilities when you have to harvest the crop then what do you do?

(i)……

(ii)……..

14.8 After reaching to market, if you do no get the expected price then what do you do?

(i)……

(ii)……...

14.9 During the period of storage of produce if any factors (insect-pest etc.) damage to produce, then what do you do?

(i)……

(ii)……...

15.0 Suggesting innovation for information delivery and market linkage services:

15.1 Information about new varieties from your nearest KVK/Institution
(i)……
(ii)……

15.2 Information about new technology from
(i)……
(ii)……

15.3 Information about market price through
(i)……
(ii)……

Innovation area: ----------

VITAE

Name of Author	:	**Kuldeep Singh Baghel**
Mother's Name	:	Smt. Mankuvar Baghel
Father's Name	:	Shri Luxmi Narayan Baghel
Date of Birth	:	08.07.1988
Permanent Address	:	Shakti Mata Temple Near Holipura Distt. Datia (M.P.)
Contact	:	Mob.: 9827094329

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Educational Qualifications :

S. No.	Name of examination	Board/ University	Year of Passing	Marks Obtained	Division
1.	High School	M.P., Board Bhopal	2003	49.60%	2nd
2.	Higher Secondary	M.P., Board Bhopal	2006	69.88%	1st
3.	B.Sc. (Ag.)	RVSKVV, Gwalior (M.P.) CoA, Gwalior	2011	66.00%	1st
4.	M.Sc. (Ag) in Ag. Economics & Farm Management	RVSKVV, Gwalior (M.P.) CoA, Gwalior	2014		

I have submitted my thesis in 2014, during my course work in partial fulfillment of the requirement for the degree of M.Sc. (Ag.) in Agri. Economics & Farm Management

Date : .....

Place: .....

(Kuldeep Singh Baghel)