Summary and Conclusion
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In India the agriculture sector has witnessed developments in the form of land reforms, Green revolution, minimum support price, and new economic reforms. During the post reform period, the new agriculture arrangement which took place in India has changed the overall traditional agricultural land use pattern in India. This is true for the state of Haryana as well. All these reforms have impacted favourably in terms of productivity and production of crops but they have inadequately affected crop stability. Only a few crops such as rice and wheat were seen to be stable. While the coarse cereals and pulses are adversely affected in area and production in Haryana.

Agriculture continued to shape the economy of Haryana while undergoing a number of changes during the post reform period. The present study focuses on the research questions pertaining to spatial and temporal change in the following aspects of agriculture: Land Use Pattern, Cropping Pattern, Cropping Intensity, Crop Concentration, Crop diversification, Agricultural Productivity, cropping Intensity and Status of the Farmers (small, marginal, farmers who left farming). In particular the following questions are put forth: How did the economic reforms influence the agricultural situation in the state of Haryana? Which aspects of agricultural economy were influenced to a greater degree, in particular, how has land use, cropping pattern, crop diversification and crop productivity and cropping intensity responded to the reforms? What have been the trends and spatial variations in different aspects of the agricultural sector? What is the process of change in the status of workforce dependent on agriculture and what has been the impact of reforms on agricultural farmers who left farming?

The focus of the present study is on the research questions pertaining to spatial and temporal change in Land Use Pattern, Cropping Pattern, Crop Concentration, Crop diversification, Agricultural Productivity, Cropping Intensity and Status of the Farmers (who left farming).

The study is empirical in nature. An average of data for three successive years at two point of time i.e. 1990-92 (as pre reform period) and 2010-12 (as post reform period) has been used to avoid anomalies created by year to year fluctuations in weather. The data were examined for the state at the level of district in four agro climatic zones identified by Planning Commission, Haryana. It were represented through tables and maps. For deriving
the results, statistical techniques were applied. Mapping was done using appropriate cartographic methods. Changes in land use pattern in major five land use categories were analysed in terms of changes in percent share of area to total reporting area of the state. Cropping patterns were examined in terms of changes in percentage share of area for individual crops in total cropped area. Crop diversification index was examined using Herfindahl crop diversification and for measuring crop concentration index, location quotient technique was used. The two indexes of productivity used in this study were calculated as; land productivity in terms of market value of agricultural output per hectare of cropped area and labour productivity market value of agricultural output per agricultural worker. To glean the impact of various conditions of small and marginal farmers and agricultural labourers, a household based field survey was carried out in selected sample villages in the state.

The study is based on primary and secondary sources of data which was collected personally by the researcher from various state offices and libraries, etc from the following secondary sources which contained both published and unpublished sources. Primary data was obtained through field survey in selected sample villages of the state.

In addition to the introductory chapter that dealt with the nature of the problem, conceptual framework, review of the previous works done in this field, research methodology, period of the study, data sources, and objectives of the study, the present study contains six chapters. A broad profile of the land, people and economy under following headings: physiography, climate, soil, groundwater resources, natural vegetation, minerals, population and settlement, polity, economy and planning of the state were dealt with in the second chapter. Third chapter highlighted the overall changing spatial pattern of land-use and cropping pattern in the state. Chapter four dealt with the changing spatial pattern of crop concentration and crop diversification. Chapter five deals with the changing spatial pattern of land and labour productivity and cropping intensity in the state and their explanatory variables which were also analysed. Chapter six identified the changes in the socio economic status of the farmers who had left farming in the state. It also suggested some policy measures to overcome the problems identified in the study. Major findings of the study were summarized in chapter seven. Suggestions have been made to overcome the existing problems and imbalances in the state agriculture.

The second chapter dealt with the land, people and economy of Haryana. The gradient of the land is from north-east to south-west. It is steep in the north-east and gentle in
the central parts and is irregular in the south and south western part. From physiographic point of view, the study region has been divided into three land form regions, one, the eastern Haryana plain including part of the Shiwalik tract, which is composed of sand, silt, clay and conglomerates ranging in the age from Middle-Eocene to lower Pleistocene. Two, the western region, which is different from eastern Haryana plain and southern Haryana plain because of the presence of a number of sand dunes of varying heights and magnitudes. The third is the southern Haryana plain which is different from the western Haryana Plain because of the presence of the Aravali offshoots and its slope towards the north in its western parts and undulating character of the surface. The climate of the state is subtropical, semi-arid to sub-humid, continental and monsoon type. The average rainfall of the state is 560 mm which varies from less than 300 mm in south-western parts to over 1000 mm in the hilly tracks of Shiwalik hills.

A great variety is recorded in the soils of the region. Eight prominent type of soils are found namely, Shiwalik Soils, Piedmont soils, Loamy Soils, Light Loam Soils, Sandy Soils, Silty Clay Soils and Rocky Soils. These soils are suitable for a variety of crops like wheat, rice, maize bajara, sugarcane, rapeseed and mustard etc. Major problem of the soils of this study region are soil erosion, salinity, alkanity, acidity etc. Haryana has little mineral wealth. Iron ore, limestone, and slate are the only principal minerals economically exploited at present. Other minerals are lime, China-Clay 7, dolomite, quartz and silica. Haryana is an intensively cultivated state and deficient in natural vegetation. The state’s total forest area is spread over just 0.155 million hectares. The lower Shiwalik region, pine especially the lower Shiwalik pine is found mixed with scrubs and thorny species of trees.

According to the 2011 Census of India the state’s population density was 573 persons per square kilometer as compared to 324 in India. It is one of the less urbanised states of India, with 38.92 per cent urban population. The state has a low sex ratio of only 861 females per thousand males. The literacy rate of Haryana is 76.64 per cent and female literacy is 66.77 per cent which is quite low. Female literacy rate is highest in Gurgaon (77.48 per cent) and lowest in Mewat district (37.58 percent).

Despite a poor mineral resource base, the state made a significant progress in industry. The growth has been particularly significant since 1966. In matters of industrialization the state has benefited a great deal from its proximity to the national capital of Delhi. The number of registered working factories in Haryana increased from 1168 in
1966 to 10580 in 2011-12. The number of registered working factories in Haryana increased from 1168 employing 71016 workers in 1966 to 10580 employing 794308 workers in 2011-12 (Statistical Abstract of Haryana, 2011-12). However most of the industrial development was confined to the eastern part of the state and particularly near the national capital.

Ironically despite being agriculturally rich, the agro-processing industries are few to count. The state have 13 registered working agro factories per lakh of population and 684 workers employed in registered working agro factories per hundred square kilometers. Gurgaon, Panipat and Faridabad districts have maximum registered factories in the state. These districts have mainly cotton and food grains based factories like, textile, food products and beverage.

Land use pattern, cropping pattern and changes therein are discussed in the third chapter. Land is a resource simultaneously recognized as a resource base. It is the main platform for all human activities and the land use changes are of utmost important elements with respect to socio-economic and environmental changes in any ecosystem.

In this chapter it was observed that there were great variations in land use patterns in different land use category. During 1990-92 to 2010-12, the total cultivable area decreased by 3.00 percent, forest area decreased by 2.87 percent, while there was significant percent increase i.e. 5.85 percent in area under land not available for cultivation. From the study it could be substantiated that there is hardly any scope to increase the cultivable area in future as it has already reached saturation point.

In case of net sown area marginal decrease was observed over a period of two decades. It is because of the expansion of urban areas and industrial development that more agricultural land has been brought under construction work, human settlements and other non agricultural uses and very less land has been added to net sown area. The percentage of net sown area was recorded high in areas having flat topography, well developed irrigation facilities, etc.

The proportion of land not available for cultivation had increased by 5.85 percent within two decades. The change in this category is not uniform in all four zones but more prominent and vast in areas nearer to NCR Delhi. With escalating cost of land being near to
the national capital, the positive influence of NCR on urbanization and industrialization is visible.

Proportion of fallow land decreased from 4.65 percent to 2.96 percent of the total reporting area. Major change in fallow land category has been observed in the central and southern agro climatic zones. Maximum decrease in this category was observed in the NCR nearby areas where most land use change due to development activities is transferred from crop land or fallow land to mainly commercial and transport network.

Decreased area under forests highlights the alarming situation of environmental health of state. This decline is witnessed in all four agro-climatic zones. The reason for diminishing forest land has been its use for residential, commercial purposes by private builders, by government and other agencies to meet the demand of increasing population. The proportion of cultivable waste land to the total reporting area has increased from 0.57 percent in 1990-92 to 0.83 percent in 2010-12. The main reasons for high share of cultivable waste land in Panchkula districts are undulating and dissected topography, soil erosion due to seasonal streams (choes), presence of hilly areas etc. whereas in case of Jhajjar and Rewari district, undulating sandy plains and occurrences of sand dunes are responsible for high share of cultivable waste land.

Thus, a critical assessment of land use in Haryana suggests that the major problems of land use are improper use of land. The state has different types of agro climatic conditions where one can not grow everything-everywhere. The conditions of water logging, soil salinization, rising water table of saline water in major parts and increasing industrialization has given rise in cultivable waste land. But to meet the demands of ever increasing population, man is trying to bring every inch of land under use by removing forests which lacks proper planning and it gives rise to ecological imbalance. The study of change in land use pattern in the four agro climatic zones had been revealed that the imbalances can be located in utilization of land resources and measures to correct them could be formulated. Such a study would also help in the simultaneous development of crop production, forests area, and pastures land for livestock rearing. Moreover it will also reflect the shift in land use pattern from less profitable use to more profitable and sustainable use.

Haryana has been facing rapid change in cropping pattern during post reform period. Total cultivable area decreased from 87.21 percent in 1990-92 to 84.21 percent of the
total geographical area of the state. The shift in area had been a relatively more important source of change in the cropping patterns, than the increase in total cropped area in state.

With regard to changes in cropping pattern, the share of area under rice crop in the kharif season and wheat in rabi season had gained substantial proportion of the total cropped area. All the other cereals like bajra, jowar, maize and barley were observed to decrease as a percentage of the total cropped area. Area under gram had recorded a sharp decline this is because of the lack of any breakthrough in technology in the case of gram. Also with the spread of irrigation, cultivation of gram had given way to wheat. The area under cotton also decreased. On the other hand, the area under sugarcane decreased despite the rise in support price being enhanced and the opening up of more sugar mills in the state.

Rice–wheat cropping system was prominent in northern zone because of these areas have flat land with fertile soils and developed agricultural infrastructure, adequate irrigation facilities, sugar mills etc are the main factors responsible for high concentration of sugarcane cultivation in these districts. Sugarcane in kharif season and rapeseed and mustard in rabi season were the another two important crops in the zone. Maize was also quite important as it accounted for about 2.28 percent of the total cropped area. The share of area under residual crops was 15.08 percent, fruits and vegetables had 1.96 percent. It is therefore clear from the above that in the northern agro climatic zone, the cropping pattern was dominated by rice and wheat during the rabi season in 1990-92.

During the post-reform period in the central agro climatic zone the cropping pattern prevalent during 1990-92 changed substantially. The change was most spectacular in the case of rice, the area share of which increased to 13 percent in 2010-12. Change in share of area under other crops was also quite important. After rice and wheat maximum decline in the percent share of two crops jowar, rapeseed and mustered had recorded. The share of residual crops had decreased from about 17.11 percent to 9.53 percent during the post-reform period.

Wheat continues to be the most important crop in the western agro climatic zone. The change was the most spectacular in the case of gram area share of which declined from 20.59 percent to 3.77 percent during 1990-92 to 2010-12. In the western agro climatic zone appears to have had the best potential for increasing area in favour of oilseeds and pulses. Yet in the zone, the area under wheat and rice had shown the sharpest increase. Cropping patterns of southern zone had also shifted substantially in favour of wheat and rice as against the
gram, jowar and barley crops. Most of the other crops had also lost their share in the total cropped area.

The cropping pattern in the study area has undergone a substantial change with wheat and rice emerging as a major crop rotation in Haryana. In the western and southern agro climatic zones crops that have need replaced by wheat and rice are gram, bajara, barley, millets and pulses. Area under cotton has also decreased in Haryana. Instead of expansion of sugar industry, the area under sugarcane has also decreased. The cropping pattern of the state has unnecessarily become energy-intensive and is affecting the static balance of the underground water resources in the plains of Haryana. The growth of infrastructure, irrigation and other technological factors responsible for a major shift in cropping pattern in favour of wheat and rice in the state.

A number of policy steps must be taken to encourage farmers to switch from rice, which is a water and fertilizer intensive crop in the zone, to crop of less water consuming. Pricy policy, establishment of agro-processing industries and research and development efforts can help to achieve this, so as to make sustainable alternatives more attractive to the individual farmers.

Chapter four deals with changes in crop concentration and crop diversification of 1990-92 and 2010-12. From the derived results, it was found that crop diversification index moved in a narrow range during the post reform period in almost all the agro climatic zones. During the above said period the average crop diversification index value of the state decreased from 0.67 to 0.65, which shows marginal movement towards crop specialisation.

Decrease in the crop diversification index value was observed in the western and southern agro climatic zones of the state. This decline is witnessed from 0.70 to 0.63 percent in southern agro climatic zone, 0.73 percent to 0.70 percent in western agro climatic zone, 0.68 percent to 0.66 percent in central agro climatic zone, which shows movement towards specialisation, whereas in the northern agro climatic zone crop diversification index has increased from 0.60 to 0.62.

The category of high crop diversification mainly covered by Hisar, Bhiwani, of the western agro climatic zone and Rohtak and Jhajjar of the central agro climatic zone. Here diversification was more likely to be accepted by the farmers through value addition in the
form of an integrated farming system and through intercropping because the average returns on the investment were found more favourable than the alternate crops.

During 2010-12, the ‘moderate’ category of crop diversification was found mainly in the southern and central agro climatic zones, which covered the districts Faridabad, Gurgaon, Mahendragarh and Rewari, besides Jind, and Sonipat district of the central zone. Because of the growing of more crops, during the kharif season like maize, oilseeds and rice etc., Sirsa and Fatehabad districts of the western agro climatic zone were also lies in the moderate category.

The areas of ‘low’ crop diversification covered the northern agro climatic zone of the study area which comprising the districts of Ambala, Kurukshtra, Karnal, Panipat of the northern and Kaithal, district of the central agro climatic zone. During the post-reform period, the farmers of this zone abandoned their traditional cropping practices in favour of the government-supported and more remunerated wheat-rice cropping pattern.

Notable change has been identified in western, central and southern agro climatic zone of the state where Sirsa and Fatehabad districts of the western Jind district of the central agro climatic zone and Yamunanagar district of the northern agro climatic zone shifted from high category to medium crop diversification. Change in crop diversification was also registered in Sonipat district of the central zone which had shifted to the moderate level from the low category.

The findings of the spatial pattern of diversification level in different agro climatic zone suggested that northern and central agro climatic zones are less diversified than the western and southern agro climatic zone in the state. This shows that areas of small farms holdings are less diversified than large farms holdings; also the assured irrigation and a market for wheat and paddy crops has led to specialization in favour of these crops in the northern and central zones. Crops like basmati paddy, potato, vegetables are remunerative; but these involve more risk. The study also suggests that diversification with crops is not a risk-reducing proposition whereas diversification with dairy and other agro enterprises reduces risk in the farm portfolio.

There has been tremendous variation in area under various crops. During 2010-12 the highest area on an average which was recorded under wheat and rice crops was 2477.52
thousand hectares and 1216.81 thousand hectares respectively, While the lowest area was observed under barley and maize which was 0.62 and 0.25 thousand hectares.

During 1990-92, wheat was the first ranking crop in the northern and central agro climatic zone of the state, while during 2010-12 wheat was replaced by rice in the districts of Kurukshetra and Karnal of the northern agro climatic zone. Rice was the second ranking crop in the northern and central agro climatic zones of the state in 1990-92. During, 2010-12, in the core part of the northern agro climatic zone, rice had overtaken wheat. In Bhiwani district of the western agro climatic zone, the gram crop has been overtaken by Bajra. Although significant increase has been observed in case of price and yield but this has not helped much to increase the area under gram crop. Prices have not been found sufficient to motivate farmers to intensify modern technology on their farms and increase the area under the gram crop.

In 1990-92 the northern agro climatic zone of the state comprising Kurukshetra, Karnal and Panipat districts had very high levels of concentration of rice. In these areas even though the rainfall was adequate enough to meet the requirements, the zone has continued to enjoy fairly good irrigation facilities as also to facilitate rice cultivation without risk.

Rice had gradually now becomes the most remunerative crop in the kharif season with no other functional alternative at present. This is a kind of compulsion for the farmers and therefore the farmers continue to compulsively grow rice. During the post reform period, apart from the core rice growing northern agro climatic zone, the farmers of the central agro climatic zone of the state and even Hisar and Fatehabad district of the western agro climatic zone were tempted to grow rice under sub-optimal conditions.

Sugarcane based cropping system tended to be a more viable option. Sugarcane alone is a remunerative crop and there is enough scope of value addition through intercropping. The adoption of bed planting technique could play a major role in this endeavour by optimizing the sowing time. There is merely chance similarly for other innovative technologies like the pit method of planting, nursery raising, multiple ratooning, etc.

Despite the vast ecological damage, the farmers continued persisting with the vicious cycle of wheat and rice because of assured production and market. The support price was
announced by the Commission for Agriculture with the consideration of cost and price for all major crops but it is meaningless in the absence of a constructive rationale. Practically, speaking a reasonable support price is just for rice and wheat and that comes upon a big incentive for the farmers. This shift in pattern of cropping probably happened because of the area shift as well as the enhanced productivity gains in both crops namely rice and wheat. However, it created an enormous black hole which was experienced in the cultivation of other grains. Thus, pulses were nearly totally eliminated from the cropping system in despite having an irrigated agro-ecosystem.

Although gram is the most important food grains in the country, but in Haryana state, its area as well as productivity is continuously declining. New technological mission on gram should be started to promote the growth of gram. In this context, concerned research efforts are needed to find out the main reasons for the devastation of these crops and also suggest appropriate remedial measures for correcting this undesired trend.

In chapter five spatio and temporal change in agriculture productivity was examined by taking two indices of productivity i.e. land productivity in terms of market value of agricultural output per hectare of cropped area and labour productivity market value of agricultural output per agricultural worker. Cropping intensity change also examined. It was found that land productivity (in thousand rupees per hectare) has recorded remarkable positive change; on the other hand labour productivity has recorded negative small negative change.

The period from 1990-92 to 2010-12, had witnessed an appreciable increase of land productivity in all the agro-climatic zones. Maximum change in land use productivity has been observed in the central and southern agro climatic zone where Jind and Kaithal district of the central agro climatic zone have shifted from high to very high category of land productivity. Whereas, Mahendragarh and Rewari districts of the southern agro climatic zone moved from low to very high land productivity. Although, during 1990-92, these agro-climatic zones were not the leading agricultural areas, but during the post-reform period, the development in irrigation facilities and high yielding varieties, increased the prices of the crops had enhanced the land productivity.

During, 2010-12, with the introduction of the sprinkler irrigation system for growing irrigation oriented and high price value crops, like wheat, cotton, rapeseed, mustard
and bajara has enhance land productivity in the western and southern agro climatic zones. These areas also had large size of land holdings, thus farmers grown more crops which resulted in very high land productivity (in thousand rupees per hectares).

The analysis of labour productivity change showed that the labour productivity decreased from 16.31 in 1990-92 to 16.15 thousand rupees per worker in 2010-12. Maximum change in the labour productivity was recorded in the central agro climatic zones, where it increased from 11.79 thousand rupees per worker to 13.00 thousand rupees per worker. In the northern agro climatic zone which is agriculturally developed zone, during post reform period, high degree of crop commercialization compel the farmers to grow mainly wheat during Rabi and rice during the Kharif season which resulted in a medium level of land productivity which also resulted medium level of labour productivity. Because of the small size of land holding in these districts and low extent of irrigation facilities in Panchkula district are responsible for the low level of labour productivity.

During 1990-92, the high land productivity areas of the western agro-climatic zones remained prominent during 2010-12. While in the other zones, although the high intensity of the cultivation was observed as production per unit area, but the total was shared by too many producers and therefore represents a small output. Thus, labour productivity in agriculture tends to be high in areas that are relatively sparsely populated and have larger than average agricultural holdings. When land productivity is compared with labour productivity, it portrays a realistic impression of productivity and discloses a strong spatial accord between them.

There was vast variation noted in the productivity of the crop sector across districts in the state. This clearly calls for a regionally differentiated strategy for future growth and development of the agriculture sector in the state. Cross classification of districts according to their productivity levels and other characteristics presented in the study would help to understand the linkages between productivity and other related factors. The analysis highlighted the important features of those districts that had been stuck in the ‘low’ productivity category.

High productivity of agriculture takes place under two variant situations. In the western agro-climatic zone, districts like Hisar, Sirsa, and Fatehabad, it occurs in association with good irrigation, high level of purchased inputs, relatively larger holdings and low level
of density of population. In the southern part of the central and south western part of the southern agro-climatic zone it occurs in association with somewhat different conditions, which are: high levels of labour inputs, varying levels of purchased inputs, small land holdings and medium density of population. In the second situation the physical environment is not good but the man-made environment is more favourable.

The districts that are in ‘very low’ or ‘low’ productivity range offer immense opportunities for raising agricultural production. The study provides a snapshot view of the productivity regimes across the whole of the state which can be used effectively to delineate various districts for effective and specific interventions.

Clearly, agricultural labour and land productivity affect each other and the effect of one on the other must be held constant in order to produce meaningful partial productivity measures regions. A tentative conclusion is that agricultural land productivity is influenced more by agricultural labour productivity than vice-versa. From an agricultural policy perspective there is plenty of scope to introduce measures in the interests of increasing agricultural labour and land productivity, but more so labour productivity. Agricultural labour productivity can be increased by improved health and education programmes. Land productivity could be increased by improved irrigation schemes, soil-erosion prevention programmes and by the use of modern strains of crops and fertilizers.

Changes in the status of farmers in the state are discussed in chapter sixth. The process of depeasantisation of Haryana had begun since the early 1990s and gathered momentum after the 2000s. This study explores all the issues that were relevant to the process of depeasantisation. This field survey covered 42 villages, 2 from each district of the state where the census showed that 960 farmers (11 percent) had left farming, of these 560 were had remained in the villages and were therefore included in the sample. The study further showed that among the farmers earlier cultivating up to 4 hectares, 28.31 percent had joined the labour market, 20.31 percent had become employed in paid private / government jobs and 26.68 percent had become involved in started some low-skill, self-employed venture. And 24 percent of those who had left farming were not satisfied. There are no strategies or policies to assist them. Those who sold land in distress to repay old debts were in no way any better-off. There were 9 percent who were living on meagre land rentals as ‘distress-rentiers’ and were more prone to drug addiction. Majority of the distress farmers who had left since long have had gone further downhill and were worse-off.
Some of the farmers having larger land holdings had also left farming but for different reasons and to take up different things because of their existing economic base they were the ones who had successfully get pulled out from farming in contrast to the small and marginal farmers who were being pushed out. Only 7 percent larger farmers had sold land in contrast to the 30 percent of their counterparts among the smaller landholding owners. In terms of increase in income, larger landholding farmers had a higher base income before leaving farming and they did relatively much better than the small and marginal farmers; the absolute gain of the large farmers can be well imagined.

As many as 70 percent of the larger holdings farmers who left farming were fully satisfied, while only 5 percent were dissatisfied. In contrast, amongst the small/marginal farmers who had left farming, there were only 21 percent who were fully satisfied and 3 as well as another 24 percent were dissatisfied. As many as 27 percent of the small, marginal and semi-medium farmers who left farming were still unsettled and wanted to change to a new profession or occupation. In contrast only 3 percent were in this situation. The small and marginal farmers who had left farming in distress had become further entrapped and have faced a situation of greater distress. This discussion suggests that there should be some long-term strategy for such ‘agrarian-class-in-distress’ that could sustain their income and improvements in the long run.

The small/marginal farmers who had left farming in distress invariably ended up joining the vast army of unskilled or semi-skilled labour or set up some mediocre low-investment, self-employment ventures for which their technical training was virtually zero or was rather very inadequate. The government should arrange for the skill building of small and marginal farmers who are desirous of leaving farming either as an alternative option or even in distress, to acquire some technical skills for starting a new profession, or becoming enabled for employment in industrial endeavors or in collaboration with industry. The training should be subsidized as these prospective trainees can hardly afford to pay for it.

There should also be some form of institutional support for their prospective self-employment ventures including the institutional credit made available at easy rate of interest along with subsidy. The assistance, technical and monetary, for input supply and marketing of the produce is also important. Finally, there was a recommendation that some priority should be accorded for power connection and supply for the small units established by the small and marginal farmers. Lastly, the government should earnestly address the successful
viability and perpetuation of the small and marginal farmers. This policy would also encourage and assist the non-viable ones to settle amicably and profitably even in the non-ventures.

Suggestions

The spatial patterns identified in this research work provide very useful basis for formulating agro climatic or district specific policies for sustainable development of the agriculture in the state. The present research therefore suggests as follows:

- The state has suffered almost complete loss of natural forest and this grim situation forces us to make a clarion call to take serious remedial measures to avoid foreboding of an ecological disaster. To restore ecological balance, a massive self-sustaining, self-propagating autonomous peoples’ afforestation movement with govt. support should be launched without delay.
- There are lesser chances of increasing the net sown area with the kind of pressure on land. Though there is scope for increasing cropped area by increasing intensity of land use; this requires investments in infrastructure development, as that of irrigation.
- In the near future, area under plough is likely to decrease with the increasing urbanization, industrialization and expansion of infrastructure facilities. The solution now lies in the integrated farming system which is superior to that of traditional cropping system because the interest of farmers and public demand are more closely aligned. High debt requires farmers to focus on cash generation on regular basis.
- Considering the negative agro-ecological impact of the cropping system, a suitable crop diversification plan with soil conservation measures are essential for sustainable agriculture development.
- Emphasis should be given on those crops, which require less water and are suitable to different agro climatic zones’ conditions.
- The use of chemical fertilizers should be minimized by using alternative manure like green manure, farm yard manure and bio fertilizers.
- Considering the negative agro-ecological impacts of the cropping system, a suitable crop diversification plan with soil conservation measures are essential for sustainable agriculture development.
Poor accessibility of high yielding plant varieties for some of the high-value crops had proved to be one of the major constraints to diversification. So government should develop appropriate technology for small farmers including drought and pest resistant high yielding varieties with low gestation period which would have helped small farmers to diversify.

In low rainfall regions, where the land is not so productive certain non-edible wild seed, rich in oil for bio-diesel are emerging important. In recent years some of the fast growing non-edible oil seed species such as Pongamia and Jatropha start giving economic yields at the end of the fourth year. These crops will help in maintaining the ecological balance of soil and water resource also.

The success of the policy for crop diversification required at the foremost crop identification of suitable zone-specific diversification alternatives, creation of physical and institutional infrastructure facilities, and implementation of appropriate intervention strategies.

Various crops suggested for diversification are desi Cotton, Pulses, Maize, Oilseeds, Pearl-Millet, Sugarcane, wheat, Fruit orchards, Vegetables and Fodder crops. Most of these crops are low water consuming crops that will help in reducing the fast depleting ground water.

The soils of the central and northern agro climatic zones are fine textured with negligible bulk density and further due to pudding of soil for rice crop the sub-surface hard pan has formed. To counter this problem sand should be added to fields and the paddy crop should be completely avoided.

Agricultural land productivity is influenced more by agricultural labour productivity than vice-versa from an agricultural policy perspective there is plenty of scope to introduce measures in the interests of increasing agricultural labour and land productivity, but more so labour productivity. Agricultural labour productivity can be increased by improved health and education programmes.

Land productivity could be increased by improved irrigation schemes, soil-erosion prevention programmes and by the use of modern strains of crops and fertilizers.

In crop-based agriculture, there is possibility of increasing employment by substitution of crops. In this context, vegetable growing is more labour-intensive as
compared to many other crops. As the demand for vegetables would continue to rise in the country for many years to come, farmers, especially small and marginal in well-endowed regions, can therefore specialize in vegetable farming.

- The government should arrange for the skill building of small and marginal farmers who are desirous of leaving farming either as an alternative option or even in distress, to acquire some technical skills for starting a new profession, or becoming enabled for employment in industrial endeavors or in collaboration with industry.

- On the policy front, efforts should be made to create off-farm employment opportunities for these farmers. The public investments should be made to remove the regional productivity gaps, as it will enhance income of these farmers. Assuring remunerative prices and up-scaling of the marketing and input supply facilities are the need of the hour to promote dairying and other allied activities among these farmers. All these measures will go a long way in easing the financial stress on marginal and small farmers of the area.

- In the prevailing economic scenario, it is difficult to pull out or push out these farmers out of agriculture in a short-run and hence the solution lies in making them part-time farmers having access to diversified sources of income as has happened in some of the South-East Asian countries.

- The training should be subsidized as these prospective trainees can hardly afford to pay for it. There should also be some form of institutional support for their prospective self-employment ventures including the institutional credit made available at easy rate of interest along with subsidy.

- The assistance, technical and monetary, for input supply and marketing of the produce is also important.

- Finally, there was a recommendation that some priority should be accorded for power connection and supply for the small units established by the small and marginal farmers. Lastly, the government should earnestly address the successful viability and perpetuation of the small and marginal farmers.

- This policy would also encourage and assist the non-viable ones to settle amicably and profitably even in the non-ventures.
Above mentioned suggestions should be implemented to the zone wise agro climatic conditions by the government planners and farmers, then cropping pattern can be made sustainable. Haryana government should now focus precisely on the sustainability of agriculture and making it globally competitive, and strengthening the economic well being of the farmers. These suggestions are very vital for state agriculture because of its being the food bowl of India.