CHAPTER 7:
SUMMARY AND FINDINGS

Agriculture occupies most important role in Indian society and its economy as well. At the time of Independence, agricultural sector was primitive in nature and dominant in terms of its contributions to GDP. Realizing its importance, since 1950s, development of agriculture has been in the forefront of all economic policies, primarily to transform it into a vibrant sector, several policy initiatives were introduced and as a result agricultural sector in India which grew at the rate of about 2.6 percent per annum in the post-Independence era. After the introduction of the new agricultural technology in form of “package of improved practices” which led to achieve spectacular growth in food grain production from 50 million tons in 1950-51 to 235 million tons in 2010-11. The contribution of chemical fertilizer has transformed India into self-sufficient stage, Though the first Five Year Plan viewed fertilizer as a supplementary to organic manure, the real push to fertilizer came from second Five Year Plan onwards, According to XI Plan, projected consumption per hectare is 185.81 kgs for the year 2011-2012 and this summarizes the importance of fertilizer in Indian agriculture. Keeping in view the importance of this vital input, Government of India, through various policy measures, is ensuring availability of adequate quantity of fertiliser at reasonable prices to the farmers and also has tried to give a reasonable return to industries so that production also can keep pace with demand, to encourage fertilizer consumption and which in turn influences agricultural productivity. During the early phase of development in the fertiliser sector, the emphasis was laid more on
promotion and popularisation of fertiliser, stepping up its indigenous production and equitable distribution. During the later stage, i.e., after initiation of economic reform process in 1991, the focus of the government was towards balanced fertilisation besides addressing the issues relating to pricing and subsidy arising out of rising subsidy bill.

And it was observed that unstable price environment would have impact on fertilizer consumption, agriculture production, cropping pattern, agriculture income and particularly on the poor and marginal farmers. Particularly the policy of withdrawing subsidy on fertilizers and resultant increase in its prices had evoked interesting discussions, arguments and inferences. Arguments in favour of removing subsidy to fertilizer was on the contention that it was leading to wasteful consumption causing environmental and others problems, while, arguments in favour of continuation of subsidy were on the ground that the small farmers would be affected thereby their production and yield, and as soil fertility reduced over years by continuous crop production which should be compensated by application of fertilizer thus fertilizer should be kept at affordable prices.

Various dimensions to the impact were expressed and supported by theoretical and empirical studies. Hence a review provided an insight into various studies that have come out with interesting findings pertaining to issues like role of fertilizer in agriculture, fertilizer subsidy, balance use of fertilizer, factors influencing fertilizer consumption, improving fertilizer use efficiency, role of fertilizer in determining output, farming practices, impact of fertilizer prices etc. However, there is dearth of such studies which analyze the influence of fertilizer
price on its consumption; impact on welfare of the farmers and therefore, this study was envisaged. **The Specific Objectives are: a)** To study the impact of fluctuations in fertilizer prices on their consumption, production and cropping pattern (macro and micro level), b) To examine whether withdrawal of subsidy to fertilizers lead to judicious consumption of fertilizer or not., c) To know whether the consumption of fertilizer has decreased or not and to analyze its effects on welfare, d) To make policy oriented suggestion and conclusion.

Macro picture at national level indicates that fertilizer consumption was around 50 thousand tons in 1950-51 picked up very fast during the late-1960s and 1970s. In 1970-71, total fertilizer consumption increased to 2.26 million tons, which further increased to 12.73 million tons in 1991-92. During 1990s, total fertilizer consumption fluctuated between 12.15 and 16.8 million tons with the exception in 1999-00, Total fertilizer consumption had reached a level of 26.5 million tons during 2009-10., Out of which Nitrogenous fertilizers alone account for nearly two-third of total nutrient consumption in the country. The share of N was 78.5 per cent in 1950s, which declined to 68.6 per cent in the sixties, 67.9 per cent in the seventies and further to 65.7 per cent in the eighties. However, the share of N increased to 67.9 per cent in the 1990s, which fell to 62.9 per cent in the 2000s. in 2008-09 it is 75% This addition of fertilizer has been a crucial input to Indian agriculture for improving Productivity to meet the food demands of a growing population. Along with a number of supporting factors like high yielding varieties of seeds, assured irrigation, access to credit and land reforms, chemical fertilizers enabled India to become self-reliant in terms of food security. Further,
the data indicates that the area under non-food crops as a proportion of the total cropped area is increasing with dominance of food crops. During the initial stages of the economic planning in India, 76.7 percent land was put under food crops and about 23.3 per cent on non-food crops. By 2001, area under food crops had come down to 65.83 percent and under non-food crops has increased to 34.17 percent. This shift in the allocation of area from food crops to non-food crops reflect a change from subsistence cropping to commercial cropping. This shifting of land from food crops to non-food crops was mainly influenced by the prevailing price in market and profitability per hectare. Similarly, here it can also be concluded that, there is pre dominance of cereals, about 54.43 percent of the area is devoted to the production of cereals, while only 11.4 percent is devoted to pulses. Though, the area under both cereals and pulses is increasing but the rate of increase in area under cereals is greater than that of pulses. Within cereals, area under coarse cereals is gradually declining since 1950-51. This is due to the feeling that coarse cereals are inferior goods. Furthermore, area under fruits and vegetables and oilseeds is gradually increasing. This is because the consumption pattern is shifting from cereals to non-cereals and these changes will have implications on the consumption of fertilizers.

The micro level finding is confined to three villages in Bellary and Gadag District for micro analysis. Selection of the districts was made on the basis of level and quality of irrigational facilities, fertilizer consumption and cropping pattern. In other words, the districts with extremes in fertilizer consumption per hectare were selected while giving adequate importance to irrigation facilities and
crops grown. The micro level study has been carried out in three villages (stratified-random sampling) in Bellary and Gadag districts of Karnataka state, covering both Rabi and Khariff seasons for the year 2001-02, with a sample size of 201 households, drawn from Ganikanahal, Chaganur and Huilgol villages, to be more specific 59 households were drawn (through random sampling) from irrigated village, followed by 76 from the semi-irrigated village and remaining 66 households are drawn from dry land village. The data were collected by canvassing a questionnaire to the heads of the households and personally recorded the responses. Questions contained both general as well as specific queries with focus on the pattern of fertilizer consumption across the crops by different size class farmers, method of application, yield levels, perception towards fertilizer price hike etc. The study utilized both qualitative and quantitative data for analyzing the objectives of the study, the sources constituted both secondary and primary data.

The profile of the villages chosen for the study reveals diverse socio economic features, and in all three villages, house holds belonging to different caste and creed were found, majority of the house holds are from upper caste and own more land. The average family size is seven, the literacy rate in all the three villages is less than district average literacy rate, the main land tenure system followed is cultivation of own land, leased-in, lease-out, or both. When monsoons are good, the rich farmers lease-in more land and vice verse. These practices were more pronounced in Ganikanahal and Chaganur villages compared to Huilgol village. In the study area, the representation of marginal, small and
medium are more in Ganikanahal and Changanur, whereas, the big and medium size-class farmers are more in Huilgol. In spite of diverse crops cultivated, cultivation of food crops dominate (paddy and jowar) in total gross cultivated area. Major source of irrigation is by canals in Ganikanahal and in Chaganur, while in Huilgol, it is tube wells.

The micro analysis of fertilizer price hike on fertilizer consumption, across crops, size class of land holdings and stages of cultivation reveals that fertilizer consumption has increased in spite of price hike. Irrigated and semi irrigated villages, whereas remained stagnant in dry villages. The fertilizer consumption pattern among different farm categories reveal that large and marginal size class farmers in Ganikanahal, and Chaganur had decreased the use of fertilizer respectively, because of severe drought and partially due to increase in prices of fertilizers whereas in Huilgol, only marginal farmers had increased the fertilizer consumption. Nutrient wise, across all size classes, the use of N and P had increased compared to K. While crop wise consumption of fertilizer shows that there has been an increase in fertilizer consumption in both the seasons and also across the size classes. Another important revealing feature was in case of paddy (HYV) to which tremendous use of fertilizer was found when compared to other crops and the proportionate use of N is more evident to P and K. The total fertilizer use to all the crops had increased, and use of N and P was more compare to K, and more fertilizer was used for crops particularly paddy and Jowar, across the stages of cultivation more N and P in the first two stages were used and K had decreased in all three stages, fertilizer to crops like sunflower, safflower and
gram, was not used while in huilgol village more N was used for gram and K was not used. No much diversion were observed in cropping pattern, the food crops continue to dominate the gross cropped area by Paddy and Jowar, as they were more remunerative.

In ghanikanahal increasing trend in consumption of fertilizers between two years was observed from 140.08 kgs in 1991-92 to 177.48 kgs in 2001-02, an increase of 26.70 per cent by all the respondents. Chaganur recorded increase to 130.06 kgs in 2001-02, which was 84.95 kgs in 1991-92 i.e., growth of 53.10 per cent. Huilgol, a dry village where fertilizer consumption per acre by all the sample households in the village was almost stagnant in 2001-02 when compared to 1991-92 consumption levels i.e., from 20.78kgs to 20.25 kgs. It was reported by farmers that fertilizers use are less remunerative without adequate rainfall. In terms of productivity, Ghaikanahal recorded significant improvement in productivity levels across all the corps for the years under study, viz., Paddy, Jowar, and Bajra. The fertilizer application had increased in case of Paddy and Jowar also its productivity levels from reference year to 2001-02. Similar in case of Bajra. However, despite increase in consumption of N, drop in productivity levels were observed in chilly.

In Chaganur village, productivity of Paddy had significantly increased with corresponding increase in rate of fertilizer application. In case of Jowar, the application of fertilizer had doubled but productivity had increased only marginally. In case of Bajra, production had increased in spite of low fertilizer application. In case of sunflower, the proportionate use of fertilizer and
productivity level were more or less same when compared to 1991-92 but in year 2001-02 the productivity level decreased in spite of maintaining the same quantity of fertilizer. However Huligol village recorded an increase in productivity level of Jowar and Sunflower as increased in the year 2001-02 and also the use of quantity of fertilizer. But in case of Cotton, application of fertilizer had declined in 2001-02 but productivity level had increased. Whereas for Cotton, Gram, Red Gram and Safflower the quantity of fertilizer application had decreased but productivity level had increased in 2001-02. However for Onion, there has been an increase in fertilizer used and also output level when compared to previous year’s production data.

From the field observations it can be inferred that, inspite of the fertilizer price hike the fertilizer consumption, across crops, size class of land holdings and stages of cultivation at micro level reveals that fertilizer consumption has increased in irrigated and semi irrigated villages, while remained stagnant in dry villages. The fertilizer consumption pattern among different farm categories reveal that large and marginal size class farmers in Ganikanahal, and Chaganur had decreased the use of fertilizer respectively, whereas in Huilgol, only marginal farmers had increased the fertilizer consumption. Nutrient wise across all size classes, the use of N and P was prominent, compared to K. Crop wise consumption of fertilizer showed that there has been an increase in fertilizer consumption in both the seasons and also across the size classes. Another revealing feature is in the case of paddy (HYV) is there is a tremendous use of fertilizer and the proportionate use of N is more evident compare to P and K. as
farmers opined that N is more important in raising crop yields compared to P and K. and across the stages of cultivation more N and P in the first two stages were used and K had decreased in all three stages, crops like sunflower, safflower and gram did not receive any fertilizers while in huilgol village more N was used for gram and no K was used. No much diversions were observed in cropping pattern, the food crops continue to dominate the gross cropped area (Paddy and Jowar due to irrigation facility about 97%, 75% 45% respectively).

With reference to the price of nutrients and proportion of their application following were observed at macro and micro level. There exists a wide gap between what is applied and what has to be applied in the fields, farmers have deviated from the recommend doses of NPK applications compared to the package of practice recommended to various crops. The average quantity of fertilizer applied varied across crops ranging from as high as 130kgs per acre for paddy (HYV) to as low as (18) kgs (local) and 57.7 kgs per acre for Red gram. This clearly indicates the formers are applying heavy dose of fertilizers in irrigated areas for HYV crops when compared to local varieties and high rate of application for commercial crops compared to food crops was evident. The ratio of NPK applied also varies greatly from crop to crop. Some of the reasons for non adoption of recommended dose of fertilizers were inadequate incremental returns, lack of knowledge about crop wise recommended doses of fertilizer, lack of capital, lack of assured rainfall/irrigation facilities and inadequate availability of fertilizers., resulting in welfare loss.
Some policy options can be made out of this study:

India has made a spectacular progress in terms of fertilizer consumption but the recent deceleration in agricultural growth rate clearly indicate that fertilizers use has reached a saturated levels and there is less scope for further increase. As adoption of fertilizer responsive technology coupled with expansion in irrigated area and other facilities in the late 60s had set in the process of technological transformation which continues to benefit a few regions. It is time for evolving a second green revolution to tap the potentials by evolving viable technology in those areas where the green revolution failed, and further use can be augmented by bringing regions consuming fewer fertilizers, dry lands and a hilly region which augments fertilizer use, which can bailout from food.

The fertilizer consumption is determined by both price and non price factors, but irrigation has more decisive influence on the consumption compared to others factors. Fertilizer use in future depends not only by increasing the irrigated area and generating ground water facilities but also maintaining a uniform fertilizer price of all the nutrients to increase fertilizer consumption, which leads to increase in agricultural production and formers income in particular.

The price parity of the nutrients has distorted the ideal use ratio, though nutrient based pricing policy is promoted but still the use of N dominates over Pand K. the excess application of N will not only affect the productivity levels but also leads to scarcity in other areas, for which fertilizer use practices have to be addressed first with the coordinated efforts of agricultural extension officers,
agricultural scientists, farmers and other stakeholders by making soil testing mandatory, and periodic field demonstrations, lectures, organizing field camps and create awareness about the optimum use of fertilizers which increases the fertilizers use efficiency and reduces the input costs. At the grassroots levels, the panchayats and the agricultural extension officers have to play a decisive role in improving the fertilizer use ratios. Hence, it is necessary that there requires a coordinated efforts of District agricultural officers, fertilizer industries, agricultural scientists and farmers to arrive at region specific models. The role of fertilizer industry is also very crucial by meeting the fertilizer needs, timely availability of fertilizer, maintaining the quality of fertilizer.

Micro level evidences indicate that farmers are using more fertilizer for food crops compared to non food crops, and have limited the use to macro nutrients only, the importance of micro nutrients in restoring soil fertility, improving fertilizer efficiency and productive levels. The use of balance nutrients can be addressed by making soil testing mandatory, renovation and improvement in application practices and efforts to promote the use of organic manure, farmyard manure, green manure, bio-gas etc have to be made and also promote the importance of using integrated nutrient mix which is environmental friendly and decreases the demand for chemical fertilizers which help to restore the ecological balance.

At macro level, a well coordinated fertilizer and agriculture policy has to be evolved which alone will not suffice the agricultural issues, but along with coordinated programmers like dry land technology, increase canal irrigation
strengthen and expand financial institutions, increase the number of soil testing laboratories, use of information technology, etc. have to be evolved to attain the targeted growth rate.