Maize, also known as corn, is cultivated in more than 165 countries on 177 million ha, with a production of 875 million tonnes and productivity of 5 tonnes ha\(^{-1}\). The maximum area under maize cultivation is in the United States (35.4 million ha), and is followed by China (35.0 million ha) and Brazil (14.2 million ha). India ranks fourth in maize acreage in the world. Maize is the third most important crop of country after rice and wheat and is being currently grown on 8.71 million ha with production of 22.26 million tonnes and productivity of 2,556 kg ha\(^{-1}\). Though, maize is cultivated round the year in the country, majority (85%) of it is grown in \textit{kharif} season followed by \textit{rabi} (13%) and spring (2%) seasons. The most important maize growing states are Karnataka, Rajasthan, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh, Maharashtra and Bihar which account for more than 70% of area under maize. Two states namely, Andhra Pradesh and Tamilnadu have high maize productivity (> 4000 kg ha\(^{-1}\)), while the productivity is low (< 2000 kg ha\(^{-1}\)) in Uttar Pradesh (Yadav \textit{et al.}, 2014).

In recent years the area under hybrid maize has increased tremendously, in northern parts of the country. Being a potential crop in India, maize occupies an important place as a source of human food [25%], animal feed [12%], poultry feed [49%], industrial products mainly as starch [12%] and [1%] each in brewery and seed (Dass \textit{et al.}, 2008). HQPM-1 is the first yellow grain QPM single cross hybrid, which is particularly responsible for enhancing lysine and tryptophan content of maize endosperm protein.

Maize is a tall growing, widely spaced crop which can accommodate short and medium duration crops like blackgram and soybean. This approach may increase the possibility to generate the yield recovery of such system. Under rainfed conditions, introducing additional population of intercrops without reducing the population of base crop give rise to severe competition between crop plants for soil moisture and nutrients. The proportion of intercrops to the base crop is an important factor in minimizing the risk to the base crop during adverse weather conditions like low rainfall.
Pulse crops play an important role in agriculture. Being rich in proteins, carbohydrate, mineral, vitamins and crude fiber constitute major component of vegetation diet of vast majority of people of India. Besides these, they have unique property of maintaining and restoring soil fertility through biological nitrogen fixation as well as conserving and improving physical properties of soil by virtue of their deep root system and leaf fall. Pulse crops are grown in about more than 100 countries covering an area of more than 65 million ha with more than 47 million tonnes production. India is leading country in both area and production of pulses, which constitutes about an area of 23.47 million ha and production 18.45 million tonnes and average productivity 786 kg ha$^{-1}$ (Anonymous, 2013). The important and diverse roles played by pulses in the farming systems and in diets of poor people, make them ideal crops for achieving the goals of “reducing poverty and hunger, improving human health and nutrition, enhancing ecosystem resilience”. Legumes in this regards are considered to be better alternatives for securing nitrogen economy and increasing yield of maize besides bonus yield, greater productivity of land per unit time and space, yield advantage and higher net returns of the intercropping system over monocultures (Shah et al. 1991).

Cereal-legume intercropping system was most important practice in India since time immemorial. In India cereal-legume intercropping is mainly practiced for subsistence agriculture i.e., to get full yield of cereal crops for food, legumes are included in intercropping system to get protein and some additional returns. The intercropping of pulses with maize helps in soil and water conservation and also increases the B:C ratio. The beneficial effects of a suitable planting pattern for cereal-legume intercropping system can be accessed through various competition functions (Prasad and Rafey, 1996).

The yield advantage in cereal-legume intercropping was due to their rooting habit, demand for resources at different periods of growth and nitrogen fixation by legumes. Legume inclusion in cereal based intercropping helps to increase the productivity per unit land by extracting moisture and nutrients from deeper layers of soil and short duration one which will complete their life cycle before peak demand for resources for main crop. Inclusion of legume will help in combating the problem of weeds, pests and diseases. Intercropping being a unique property of tropical and
sub-tropical areas is becoming popular day by day among small farmers as it offers the possibility of yield advantage relative to sole cropping through yield stability and improved yield (Bhatti et al., 2006).

Planting pattern in intercropping is one of the most important factors for better yield advantage. Maize is normally grown at wider row spacing; interrow space could profitably be utilized for legumes/oilseed in the interspaces for enhancing returns and also pairing of maize rows can provide more inter-row space to accommodate one or two rows of legumes without reducing the plant population of maize. The technique of paired row planting has been developed to harness the maximum advantage from intercropping system (Singh and Chauhan, 1991). Planting technique also plays a vital role in proper crop establishment and efficient use of rain water particularly in rainfed areas (Reddy et al., 2009).

Intercropping in appropriate planting pattern has ample scope for improving the bonus yield of intercrops without adversely affecting the yield of main crop. Beside this, intercropping acts an insurance against hazards of weather, guards against crop failure by disease of insect-pest incidence, ensures efficient utilization of land and other resources (Paradkar et al., 1993). The technique of paired row planting (with required plant population of main crop) has been developed to harness the maximum yield advantage from an intercropping system. One of the main reasons for higher yields in intercropping is that component crops are able to use growth resources rationally and make better use of natural resources than grown separately. Intercropping of soybean with maize can be helpful to economize the nitrogen application in maize. Special complimentarity can provide more advantages over temporal complimentarity in intercropping system as a result of efficient exploitation of resources (Willey, 1979).

Maize is grown in almost all states of the countries in various seasons. The crop is largely grown under rainfed conditions where soil is not only thirsty but also hungry for nutrient too. The less consumption of fertilizer in maize with traditional varieties was one of the major reasons for low maize productivity and profitability in such ecologies. The better nutrient management will synergistically act with water to improve the maize productivity in the country. Moreover, with the adoption of single
cross hybrid technology there is need of proper nutrition of the maize crop for harnessing benefit of the hybrids at farmer’s field. The application of inorganic sources of nutrient in right amount, at right time and right place will further enhance the maize productivity in different soil types and agro-ecologies.

The fertilizer requirement of intercropping system may also vary from sole cropping owing to inclusion of crop of dissimilar nature. Fertilizer management is the key factor in this system because the crops involved are different in their nutritional requirement. Maize is an exhaustive crop requires high amount of nutrients, while blackgram and soybean being a capable of fixing atmospheric nitrogen and can be grown with little nitrogen with greater demand for phosphorus. Several studies have been conducted and recommendations have been made for fertilizer requirement of individual crop, but fertilizer recommendations for intercropping systems are very much limited as it depends upon population and yield potential of the component crops in intercropping system. Fertilization in legume crops is important at initial stages. Nutrients in soil solution are replenished either by desorption from soil surface, mineralization of soil organic matter or by addition of fertilizers. Fertilizer application is one of major production input recognized in any crop-production system (Rana et al., 2001).

Keeping in view the above fact the present investigation entitled “Effect of fertility level and planting pattern on the performance of kharif maize (Zea mays L.) intercropped with black gram and soybean” was performed at the agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, U.P. (India) with the following objectives -

1. To study the effect of fertility level and planting pattern on growth, yield attributes and yield of maize under intercropping system.
2. To study the effect of fertility level and planting pattern on nutrients content and their uptake in plant under intercropping system.
3. To workout the effect of treatments on the economics.