2. REVIEW OF LITERATURE

There have been few scientific studies in the field of technological gap and constraints to production of different crops. The various researchers tried to study the level of knowledge and extent of adoption gap and constraints to production. Keeping in view the objectives of the present study entitled "A study of technological gap and constraints in adoption of fruit crops production technology in Uttar Pradesh" the review of available literature has been presented in the following parts:

1. Socio-economic and psychological characteristics of the grape and ber growers
2. Extent/gap of knowledge and adoption
3. Relationship of independent variables with dependent traits
4. Constraints of technological adoption gap

2.1 SOCIO-ECONOMIC AND PSYCHOLOGICAL CHARACTERISTICS OF THE FRUIT GROWERS

The various studies under this head are concerned with the various variables like age, caste, education, social participation, family size, size of holding, extent of contact, mass media exposure, attitude of farmers,
communication behaviour and interaction as found related with the adoption of improved agricultural practices.

2.1.1 Age

Dubey (1961) and Reddy (1962) observed that old farmers adopted the recommended cultivation practices more than others.

Directorate of Extension (1976) observed that majority of farmers participated in the training programme were of 25-44 age group and, literate having joint family and farming as the primary occupation and their possessed medium to large size land holding. It has also been found that the farmers acquired higher level of awareness, knowledge and adoption of improved agricultural practices.

Sinha and Sinha (1980) reported that age was found to be an important factor influencing adoption behaviour of farmers. They further revealed that age was significantly associated with adoption.

Singh (1985) reported that majority of respondents (59%) belonged to adult age group (25-50) followed by 28.5 per cent belonging to old age group (above 50) and remaining 12.5 per cent respondents were below 25 years of age.

Wasnik (1988) revealed that age was found to be related with technological adoption in both the villages. Raut and Chok (1991) reported that age of schedule caste farmers was not related with their training needs.

Hooda (1992) investigate the role of socio-economic factor such
as age, education, farm size, caste and social participation on the adoption of sprinkler irrigation. The highest level of adoption was by moderately educated (matriculate), middle aged farmers (35-59 years) of the upper caste group with medium sized holding (4-8 ha.), with no social participation.

Singh (1994) revealed that the majority of respondents were medium aged (72.50%) followed by old and young i.e. 16.66 and 10.83 per cent, respectively.

Singh (1996) observed that 45 per cent respondents belonged 20-30 years age, while 30 per cent belonged to 30-50 years age group, 17.5 per cent belonged to 50 and above and remaining 7.5 per cent respondents belonged to the category of upto 20 years engaged in agriculture.

2.1.2 Caste

Bose (1961) reported that a large number of general caste farmers adopted more of new techniques than scheduled caste farmers.

Subramanyam and Lakshnya (1973) observed that land owners and general caste farmers adopted more recommended farm practices than other caste farmers.

Singh (1977) found that highest (85.5%) of the respondents belonged to general and medium castes and remaining 14.5 per cent of other caste group. The correlation amongst castes of the farmers and adoption behaviour was found to be non significant.
Husain (1980) found that 47.5 per cent respondents belonged to general caste, 42.5 per cent were from backward caste and remaining 10 per cent were from scheduled caste category.

Singh (1985) revealed that the majority of growers owned marginal/small size of holding belong to scheduled/backward category, adult (25-50 years) age group possessed low literacy level.

Singh (1995) revealed that the maximum number of respondents were found 52.50 per cent belonged to scheduled caste, 32.50 per cent belonged to the backward caste and 15 per cent belonged to the general caste group.

2.1.3 Education level

Yadav (1964) reported that there is continuous increase in adoption of HYVs, fertilizers use and improved agricultural equipments as the educational level of farmers increases, the reason is quite obvious that literate farmers are more exposed to mass communication method as well as to the chief agency. Also the literate farmers understand easily the complicated technology.

A report of ICAR (1979) indicated that majority of the participating farmers (75 per cent) were educated up to matriculate and above, as many as 20 per cent of farmers were literate whereas only 5 per cent were illiterate.

Satya Narayana (1979) concluded that educated persons had better impact in gain in knowledge and adoption for improved farm practices.
Husain (1980) reported that 55 per cent farmers were illiterate and the literate farmers had different educational levels of education i.e., 21, 10, 7.5, 4.5 and 1.5 per cent upto primary, junior, high school, intermediate and above, respectively.

Nandapurkar and Bhilegaonkar (1988) reported that extension education had to play a crucial role to develop human resources in respect of knowledge, talent, skills, aptitude and attitude.

Chaudhary et al. (1988) revealed that education was positively and significantly associated with adoption behaviour. Raut and Chole (1991) viewed that education did not show any relationship with training needs.

Kumar (1991) revealed that the 60 per cent respondents were have joint family and 40 per cent nuclear family who participated in the adult education programme.

The maximum 31.5 per cent farmers were having primary education, 27.5 per cent were illiterate, 19.5 per cent of the respondents possessed high school qualification, whereas 13.50 per cent were graduate and remaining 8 per cent were educated upto intermediate (Singh, 1993).

Singh (1994) observed the considerable number of respondents were illiterate (26.65%) and among the literate (33.33%) had education upto primary followed by middle level (12.50%), Only 9.16 per cent were found to be educated upto high school and 5.83 per cent were graduate.

Watkins (1994) reported that Indian illiteracy have improved through fruit production and their processing.
Singh (1995) revealed out of 80 respondents, 32.50 per cent were illiterate, 23.75 per cent up to junior school, 17.50 up to primary school, 15.00 per cent up to high school and above the remaining 11.25 per cent farmers lived as a planned family.

2.1.4 Social participation

Patel and Patel (1968) found that majority of trained farmers occupied positions in village panchayat and cooperatives.

Madan (1971) mentioned that some sociologists and anthropologists hold a view that the social and cultural factors like social status, values and attitudes are the greatest impediments in the development of agriculture in the traditional societies.

Kher and Halyal (1983) reported seven variables contributing from highest to lowest in order were: extension participation index, locality cosmopolite, value orientation, education, social participation, farm mechanization index, adoption index and innovation proneness for increasing technical know-how and skill proficiency in agricultural innovations.

Singh and Patil (1988) revealed that there was significant relationship between social participation of contact farmers and their extent of adoption, while there was no relationship between social participation of non-contact farmers and their extent of adoption.

Kumar (1991) observed that the highest 50 per cent respondents were having no affiliation in organisation. Next in order 32 per cent respondents were member of one organisation followed by 18 per cent members of more than one organizations, respectively.
2.1.5 Family size

Singh (1985) observed that the highest per cent of respondents belonged to nuclear family (70%) while remaining respondents belonged to joint family (30%) system.

Kumar (1991) revealed that the 60 per cent respondents were have joint family and 40 per cent nuclear family who participated in the adult education programme.

2.1.6 Annual income

Chauhan (1970) stated that most of adopters come under the higher economic status while non adopters in low economic category.

Singh (1977) found that highest 75 per cent of the total respondents belonged to lower middle socio-economic status.

Hossain et al. (1995) conducted study the extent of adoption and the change in the socioeconomic status and income level of the sample. The increase in adoption between 1987 to 1992 was found to be fruit and vegetables preservation 42 per cent. The socioeconomic level of the sample was found to have improved. Profitability per ha was about four times as high with the improved method as compared to the traditional methods.

2.1.7 Size of holding

The land holding refers to the size of land operated by the respondents. Reddy (1962) found that the rate of adoption of improved agricultural practices increased along with increase in the farm size.
Chauhan (1970) stated that most of the adopters had large size of holding than non-adopters and revisionists. Sachchida Nanda (1972) reported that adoption indeed went up with rise in the size of holdings.

Gill and Minhas (1978) reported that farmers with large size of holding had low training needs as compared to farmers with small, marginal and medium size of holdings.

Kokate (1980) reported that farm size found to be significantly related with dairy technology.

Sinha and Sinha (1980) observed that there was no association between size of holding and adoption.

Chaudhary (1988) viewed that land holding was significantly associated with adoption level.

Kumar (1991) revealed that maximum 54 per cent respondents were from below 1 ha land holding followed by 30 per cent, 14 per cent and 2 per cent belong no land, 1-2 ha and more than 2 ha holding group, respectively.

Singh (1994) reported that the majority of respondents (37.50%) had medium level of land holdings followed by small (33.33%), marginal (16.66%) and large (12.51%), respectively.

2.1.8 Extension contact, mass media exposure and interaction

Jain (1963) reported that the adoption of improved agricultural practices is influenced by several communication channels like personal contact, demonstration, group discussion, meetings, T.V. and indirect influence.
Bhardwaj (1970) observed that the gain in knowledge from listening to radio varies with age, education, size of holding and farming experience.

Hunndel (1976) reported that extension contacts were significantly associated with adoption behaviour of the farmers regarding animal husbandry practices.

Subramanian (1982) observed strong association between extension contact and level of adoption of big farmers of the more successful societies.

Kherde et al. (1987) found that extension contact had no significant positive or negative relationship with perceived training needs of contact farmers.

Singh (1994) reported that the medium extension contact 85.83 per cent, 10.84 per cent higher extension contact and 3.33 per cent respondents were having low level extension contact.

Rao (1995) showed that 94 per cent of respondents perceive the fruit research station as a useful information centre, 92.7 per cent perceived the research station as a source of inspiration for adoption of improved practices. With regard to the awareness of farmers, 85.3 per cent of mango growers know about the organisation of Kisan Mela at the station.

Ram (1992) reported that most of the farmers had medium extension contact (65.00 and 71.67%) in present and follow up year, respectively.
Kadia (1999) observed that the variables of education and extension contact for variability in farmers technological gap of all the seven segments of sugarcane technology. Next in order which explained variation in farmers technological gap were mass media exposure and farm power (contributed significant to fertilizer and sowing operations). The least on the ladder of contribution were the variables of farm size and profitability (contributed for fertilizer use), investment orientation and social participation contributed for sowing operations and irrigation, respectively.

2.2 GAP IN KNOWLEDGE AND ADOPTION

Directorate of Evaluation, U.P. (1966-67) has reported that only 3 per cent in the state had adopted above 90 per cent recommended practices of the crop raising. It was further pointed out that about 40 per cent recommended practices of the crop raising. It was further pointed out that about 40 per cent farmers had adopted 50-70 per cent of the total package of practices and 20 per cent of them had adopted below 50 per cent of package of practices.

Several past study by Rogers and Jain (1969) reported that there is tremendous gap between knowledge, production and knowledge utilization in the field of farm technology.

Nair (1969) reported that the adoption of paddy technology was far below the recommended levels. Only 12 per cent of participating farmers adopted seed treatment. The nitrogenous fertilizers was applied by 99 per cent but majority applied only less than half of the
recommended doses. Only 6 per cent of the participating farmers applied full doses.

Singh (1973) observed that farmers had correct knowledge about the varieties, seed rate, sowing time, method of irrigations and harvesting time of almost all the major crops in two and three cropped rotation. The farmers knowledge on the doses of fertilizers was inadequate while none of the farmers was found to have little knowledge about seed treatment, chemical weed control and proper use of plant protection chemicals. Comparatively the knowledge of farmers about wheat crop was higher followed by potato, maize, paddy and toria. The degree of knowledge of farmers largely depended on the regional importance of crops.

John Knight and Singh (1975) revealed that there was positive relationship between gain in knowledge and value orientation (cosmopoliteness-localiteness) and contact with and knowledge of extension agency in respect of interview whereas the straight talk had association with adoption stage. It must therefore be the endeavour of extension personnel to encourage the farmers to imbibe. These qualities in them by arranging field visits to demonstrations plots and field trips other blocks, districts and states.

Pandey (1975) suggested that production can increase if high yielding varieties of seeds, timely and adequate use of fertilizers, plant protection measures, irrigation and management practices be ensured.
Balasubramaniam and John Knight (1977) reported that 45 per cent of the respondents had low level of scores, 30 per cent medium level and 25 per cent scored high level. Thus, it can be concluded that majority (45%) of the farmers had low level of knowledge on high yielding varieties of paddy.

Tripathi (1977) in their study of technological gap in new rice technology reported that nearly 80-85 per cent respondents were having the technological gap ranging between 66-90 per cent in key component of rice technology such as water management, diseases-pest control and fertilizer management.

Pandey and Mathur (1982) reported that the information gap towards farm production technology ranged from 21.50-77.00 per cent among non contact farmers and 10.8-77.0 per cent among contact farmers.

Singh (1982) reported that technological gap of wheat in farmers was 67.16 per cent in Bulandshahr region while in Gorakhpur, it was 74.54 per cent. He further observed that the gap of any practice for different categories of farmers was more in Gorakhpur as compared to Bulandshahr. The largest gap identified in the case of disease and pest control in both the regions but in Gorakhpur, it was comparatively at the highest level (100%).

Singh (1985) the analysis revealed high adoption of timely sowing. The big farmers were comparatively closer to the recommendation than the marginal and small farmers.
Ojha and Saxena (1987) reported tremendous increase in area year after, due to introduction of short duration and high yielding varieties, package of practices and improved implements. However the level of technical know-how and skill proficiency in handling of implements are below the level. Hence, they need special training to become competent in operations of improved implements.

Dewan (1987) found that majority of the farmers (76%) were in level of adoption of the package of practices.

Alexander and Kumaran (1990) observed the level of technical knowledge and skill among the respondents. They asked 15 questions to the respondents to assess their technical knowledge and skill. The mean score obtained by the respondents were 5.67 in Azamgarh, 6.71 in Saharanpur and 8.70 in Trichur. However, the level of knowledge and skill of all the areas were low.

Sindgi and Virupkshappa (1990) suggested the details of identification of diseases insects and their controlling measures.

Alok (1992) indicated that the maximum gap in recommendations and adoption of technologies were observed in case of chemical weed control (100%), plant protection (100%), intercultural operations (50%) and spacing (50%). He further reported that non availability of chemicals in due time was the major cause of the gap having highest mean score (2.47) followed by higher cost of chemicals (2.11), improper identification of diseases and pests (2.06), the other causes among the cause of gap of minor importance.
Pal (1992) observed the overall highest level of knowledge (61.24%) among large farmers while the lowest (52.87%) was in marginal farmers. But in case of skill proficiency, the medium farmers secured the highest level (51.26%) followed by small (50.68%), large (50.59%) and marginal farmers (46.68%). The level and pattern of adoption of small farmers (35.37%), medium (35.37%) and large farmers (35.19%) were observed more or less the same but that of marginally. It was the lowest (31.45%) in sugarcane cultivation. He also observed that the practicewise knowledge level was found to be highest in the practice of selection of soil types and land preparation in case of large (89.33%), small (84.67%) and marginal farmers (79.33%), while in case of medium farmers the highest was observed in the practice of methods of time of planting and the lowest was observed in the practice of improved implements in case of all the categories of farmers (20.00-20.60%). But in case of skill level was found the highest in the practice of selection of soil type and land preparation in all the categories of farmers i.e. 78.33 to 88.00 per cent and lowest skill was found in the practices of improved implements (19.30 to 19.70%). The level of adoption was observed highest in the practice of selection of soil type and land preparation (72.33%) among marginal farmers, in the practice of methods and times of planting among small (83.33%), medium (83.00%), while among large farmers this adoption level was observed highest in the practice of seed rate.

Further he revealed that the highest overall (average in 14 practices) gap of knowledge (47.13%) among marginal farmers, while
the lowest (38.78%), small and medium farmers appeared 42.24 and 39.16 per cent, respectively. But in case of skill gap, the marginal farmers secured the highest gap (53.42%) followed by large (49.41%), small (49.12%) and medium (48.74%). The gap in adoption was found highest to lowest in marginal, large, small and medium i.e. 68.65, 64.81, 64.50 and 64.52 per cent, respectively.

He also observed the practewise knowledge gap which was found highest in the practice of improved implements in case of all the categories of farmers (79.40-80.00%) and lowest gap in the practice of selection of soil type and land preparation in case of marginal (20.67%), small (15.33%), while the lowest gap was observed in methods and time of planting i.e. 10.67 and 9.33 in case of medium and large, respectively. But in case of skill gap, the lowest gap was found in selection of soil type and land preparation in all the categories of farmers between 21.67 to 11.33 per cent and highest gap in the practice in improved implement between 80.70 to 80.30 per cent. The practewise adoption gap was found highest in the practice of late planted cane (98.11%) followed by intercropping (98.00%) and lowest gap in the practice of selection of soil type and land preparation in case of marginal farmers.

Sarda and Khurana (1993) observed that small farmers had very high adoption gap followed by medium and large farmers in recommended rice technology in Punjab.
Nikhade et al. (1995) concluded that average adoption gap among small and big cotton growers in rural Vidabha (Maharashtra) was up to 20 per cent in respect of use of recommended quality of organic manure. In application of fertilizers and use of plant protection measures, there existed about 30 per cent adoption gap and for seed rate it was 42 and 31 per cent in case of small and big farmers, respectively. The average adoption gap in the use of recommended technology of cotton was found to be about 30 per cent.

Sharman and Khurana (1999) found the adoption of plant protection measures for the mango was poor among mango growers. They also reported that the respondents who had adopted chemicals method for the control of insect pests were in the range of 20 to 42 per cent and those who had used against disease in mango were 16.67 to 43.75 per cent.

Malik (2000) observed major gap in respect of use of plant protection chemicals (78.50%) followed by method of sowing (57.00%), doses of fertilizers, time of fertilizers application (39.50%), intercultural operations (32.75%) and irrigation (13.50%).

2.3 RELATIONSHIP OF INDEPENDENT VARIABLES WITH DEPENDENT TRAITS

Bhatt and Raheja (1961) reported that the age and education have a definite effect on gain in knowledge and skill of youth. They further reported that the boys having large sized potential holding influenced their parents more for overall change in farm practices.
Das Gupta et al. (1963) were of the opinion that there is a positive relationship between land size and the acceptance of improved agricultural practices of the farmers.

Tiwari (1954) found that membership in rural institutions and organizations is positively correlated with the adoption of improved varieties.

Gupta (1968) and Parthsarthi (1975) reported a non-significant relation between education and adoption of HYVP.

Mulay and Ray (1965) found significant relationship between caste and participation of HYVP among the general caste farmers.

Shyam (1965) and Gupta (1968) observed that the size of family is positively associated with the adoption of improved farm practices.

Kashikar (1967) reported that the agricultural technologies are needed to disseminate due to rapid invention made at the research stations. For this, the persons having formal education, land holding and social participation were significantly associated with the awareness of innovations.

Kishore (1968) concluded that farmers belonging to different socioeconomic status changed their knowledge significantly.

Nair (1969), Vyas et al. (1969) and Chaubey (1972) found that farmers social participation was positively and significantly related to adoption of high yielding varieties.
Bhaskaran (1970) stated that the social position of farmers was positively associated with the extent of adoption of technology utilization.

Chauhan (1970) observed that large size of holding and higher economic status affected the adoption positively.

Kolte (1970) reported significant relationship between adoption behaviour and knowledge level of farmers. Similar findings were reported by many other researchers (Rao, 1968 and Singh, 1968).

Lanjewar (1971) observed that farmers personal characters and psychological attributes, except their age, influenced the knowledge level.

Jha and Shakawant (1972) and Chattopadhyay (1976) reported the non significant relationship between age and participation of farmers in high yielding varieties.

Salode (1972) reported that farmers education and socioeconomic status were positively and significantly related with the knowledge level. Psychological characteristics, economic motivation and scientific orientation were significantly related with the knowledge level.

Subramanyan and Lakshva (1973) observed that farm size was positively correlated with the adoption level of farmers.

Parthasarthi (1975) reported that a non significant relationship between education and adoption of high yielding varieties programme.

Chattopadhyay (1976) found that the size of land holding was negatively and significantly associated with the technological gap.
Singh (1977) found that highest 75 per cent of the total respondents belonged to lower middle socioeconomic status. A degree of correlation was established between socioeconomic status and adoption of the farmers.

Manivannan (1980) pointed out the social participation had no significant relation with the extent of adoption.

Raheja et al. (1980) observed that regional imbalances were more pronounced in rice than in wheat, mainly because of lack of assured water supply and resources of the farmers. They also concluded that efficient water management and supply of crucial farm inputs, such as fertilizer and credit would narrow the gap considerably.

Mishra and Sinha (1981) reported positive and significant association of technological know how with education and social participation whereas, negative and significant correlation between technological know how and knowledge was observed. However, no significant association of technological know how with material possession and risk preference was found.

Salkie (1982) found that the extent of package of practices by the contact farmers was significantly higher over the non contract farmers.

Kubde and Sinha (1983) observed that the area of land possessed by the farmers, irrigated land available with them and their income levels were significantly related to the technological gap.
Pachori and Tripathi (1983) reported that among contact and non-contact farmers, majority of respondents/farmers had knowledge in all the groups. The contact farmers also had higher knowledge in all the groups as compared to non-contact farmers. Association of age and technical knowledge of the farmers of both categories was found to be significant.

Sangle and Kulkarni (1984) indicated that degree of commercialization, family education knowledge about technology significantly contributed to technological gap.

Prasad (1992) reported that technological gap was negatively and significantly associated with the knowledge of high yielding varieties, proper use of chemical fertilizers. Proper use of farm implements, proper irrigation system and application of plant protection measures.

According to Ingle et al. (1997) education, annual income, family size and social background were found to be positively related to orchard sustainability which however, was negatively correlated with the age of respondents, this indicates active participation by the young and middle age group respondents. The orchards of more scientifically oriented fruit growers with knowledge of mango and citrus cultivation were found to be more sustainable.

Singh et al. (1998) the highest technology gap was in plant protection measures followed by manure and fertilizer and irrigation management. While smallest gap was observed for vertical recommendation in valley and harvesting and post harvesting operations
in mix and high hill situations. The high technological gap was mainly due to the very small size of landholding, inadequate agriculture production infrastructure, inefficient agriculture development and extension network. The typical socio-cultural traditions and storing religious beliefs constrained the tribal community in adopting modern form production technology. It is suggested that these extend of gap can be reduced by increasing education, investment, irrigation and raising awareness about technology.

Wabhitkar et al. (1993) concluded that education, land holding, annual income, SES, economic motivation, risk preference, management orientation, cosmopolitan attitude, contact with extension agencies and mass media exposure were found to be significantly related to adoption. Age and scientific orientation were not significantly related to adoption.

Malik (2000) observed that overall technological gap about seed rate and treatment for sugarcane production technology was 74 percent followed in succession by method of sowing (64%), irrigation (63%), fertilizer application (60.90%), high yielding varieties (53.80%), plant protection (53.80%), weed control (51%) and time of sowing (34.50%).

2.4 CONSTRAINTS RESPONSIBLE FOR TECHNOLOGICAL GAP

Shah (1958) reported non availability and suitability of improved seeds, unsuitability of chemical fertilizers to dryland and small fragments of land, as the reasons of non adoption of practices.

Chaudhary et al. (1965) while studying the farmers perception of constraints influencing choice of crops and adoption of certain
recommended practices in village of Delhi, concluded that the basic constraints responsible for the gap were the non-availability of improved seeds, fertilizers and irrigation facilities. It was suggested that intensification of dosage of fertilizers specially in fruits and vegetables should be made possible if the time and techniques of fertilizers application are more successfully demonstrated to raise the responses obtained to be at par with those expected under controlled conditions at the research stations.

The report of National Commission on Agriculture (1976) revealed that all inputs needed by farmers should be made available to them any of the existing channels, namely primary cooperatives, marketing societies, agro-industries corporation and private sale depots.

Singh (1977) reported that marginal and small farmers felt the problem of identification of insect-pests and diseases which effects adversely in skillful utilization of plant protection measures.

Singh (1977) stated that timely non availability of pesticides, fungicides and plant protection equipments was barrier in the adoption of plant protection measures and the control diseases and insects and pests.

Tripathi (1977) observed that the main constraints for technological gap were ignorance about the quality, time and method of fertilizers application, inputs supply institutional finance and information transfer.

Joshi (1980) reported that main problems for non-adoption of chemical fertilizers were untimely supply, non-availability of required
amount of fertilizer, need of investment for longer period and high prices of fertilizers.

Sinha and Sinha (1980) reported that the most important reasons for non-adoption of high yielding varieties of males were lack of money, non-availability of fungicides, lack of knowledge of improved method of cultivation and lack of proper guidance them similarly. However, the information transfer and the credit and economic constraints were differently perceived the farmers. The farmers were in need of adequate and timely supply of production inputs, timely advice and training. An appropriate administrative and organizational setup is necessary to improve the level of adoption of dry land technology.

Mishra and Sinha (1981) concluded that the farmers were facing several biophysical and socioeconomic constraints like awareness of improved varieties, their germination maintenance, shortage of irrigation, on availability of plant protection chemicals, equipments, manures and fertilizers, high cost and improper storage facilities etc.

Singh et al. (1982) enumerated various causes of low productivity are (a) large area under rainfed condition, (b) lack of assured irrigation, (c) use of poor quality seed, (d) inadequate and imbalanced use of fertilizers, (e) poor management of soil fertility and soil structure, (f) diseases, insects, pests and weeds and (g) inappropriate extension education and administrative streamlining.

Maharotra (1983) marked out numerous causes and suggested strategies to overcome are water management, diseases and pests,
delaying sowing, direct seeding, low consumption and injudicious soils. Lack of cash inputs, lack of suitable high yielding varieties for different situations and lack of proper communication.

Singh et al. (1983) figured the major constraints into three groups i.e., ecological constraints, technological constraints and economic constraints.

Kulkarni and Sangle (1984) concluded that non-compatibility of recommended technology, insufficient supplies of inputs and credit, non-availability of services and supplies and lack of knowledge about technology were the most important constraints responsible for increasing the technological gap.

Singh (1985) found that the variables of knowledge about soil fertility and fertilizer management, Index of borrowing of fertilizer credit, economic motivation, farm mechanizations, state of land ownership, personal cosmopolitan sources of information and irrigation index contributed positively and significantly to the level of fertilizer use.

Chitrnis and Bhilegaonkar (1987) analysed the major constraints causing a technical gap in the process of adoption of dry land technology and grouped the constraints in four categories viz., technological, credit and economic, service and supply and information transfer. Responses of farmers indicated that they perceived the technological, service and supply constraints in the same way and were in agreement in ranking.
Singh et al. (1988) observed termites, poor economic gain, poor knowledge, lack to secured irrigation, non-availability of managerial sources, poor organization and marketing system, poor farm potential and non-availability of labour as main constraints in wheat cultivation in Agra District of UP.

Tyagi and Tyagi (1988) concluded that education and credit orientation were the most important determinants of technological gap in case of small farmers. However, credit orientation was found to be the most important factor of technological gap with regard to medium farmers. And in case of big farmers, education was found to be the most important factor.

Waghmare and Wakde (1989) revealed that input availability received the most important and got first rank. The next in orders were natural calamities, labour availabilities, finance and advisory support.

Cooperation of neighbouring farmers, lack of timely availability of skilled labour, lack of storage facilities, non-availability of threshing implements, high cost of insecticides and fungicides and lack of knowledge regarding incidence of pests were the constraints reported by the growers of Jowar seed as quoted in the study of Patil and Girase (1990).

Majority of the farmers opined that untimely supply of seed and fertilizers, spray pumps and dusters at reasonable rates, delay in getting loans and inadequacy of financial assistance were the constraints in adoption of sunflower technology as per the investigation carried out by Bhoite and Dusane (1990).
Shrivastava and Singh (1990) indicated high price of fertilizer, lack of irrigation facilities, non-availability of improved seed, lack of technical knowledge, low price of farm produce, lack of capital, non-availability of credit as the constraints faced by majority of the respondents.

According to their study conducted by Kumar and Singh (1990), unavailability of fertilizer within easy reach was assigned first rank by medium-big farmers and as low as thirteenth by marginal small farmers. High cost of fertilizers and non-availability of crop land in time were ranked second in case of medium big farmers. Unavailability of fertilizer in time got fourteenth rank by marginally small farmers. Lack of knowledge, in what quantity, when and how were the other important problems about fertilizer use.

Shrivastava and Singh (1990) indicated high price of fertilizer, lack of irrigation facilities, non-availability of improved seed, lack of technical knowledge, low price of farm produce, lack of capital, non-availability of credit as the constraints faced by majority of the respondents.

Pal (1992) observed lack of credit, lack of knowledge, and non-profitability of fodder and low market value of grain as the major constraints in the adoption of practices in black soils while almost the same constraints were identified for cultivation of sorghum in red soils. Significant relationship between constraints and technological gap was also observed. With regard to adoption of plant protection measures the respondents felt the cost, low knowledge, non-availability of plant protection equipments and damage to the crop seriously as the major constraints.
Singh et al. (1990) suggested many factors viz., unawareness of technology, improper crop adjustment, poor seed germination, need more irrigation etc. that hindered the adoption of sunflower cultivation in summer seasons.

Singh and Sharma (1990) reported various constraints faced by the farmers in the adoption of new technologies on the farms i.e. lack of credit facilities, inadequate irrigation and non availability of quality inputs were identified as major constraints in the development of farmers.

Chauhan et al. (1990) observed that 17 per cent farmers were willing to adopt agroforestry and only 16 per cent were in favour of woodlots although 88 per cent throughout that the timber supply was inadequate. The main constraints to adoption of these practices were lack of knowledge of practices and rural governing tree cutting and lack of planting material and irrigation facilities.

Singh (1992) concluded that in response to fears in response to Punjab agriculture become totally cereals dominated, farmers are diversifying into fruit production. He examines the viability of different types of orchard including grape, kinnor, mango and pear. He also reported that oily kinnor and grape were likely to prove viable and that be adopted in the near future.

Malik (2000) concluded that five independent variables of farmers, namely; education, extension contact, mass media exposure, profitability and knowledge of technology were emerged to be highly effective in improved technological gap.
Sharma (2000) in his study conducted with 125 randomly selected farmers of arid agro-climatic zone of Madhya Pradesh, India observed that age, education, land holding, extension contact, knowledge of plant protection measures were significantly correlated with adoption. However, cast, type of family and annual income had no significant correlation with adoption of plant protection measures.