CHAPTER III

REVIEW OF LITERATURE
REVIEW OF LITERATURE

A systematic review of the past relevant literature is, in fact, a pre-requisite for any research to be carried out in a sound and scientific manner. The present investigation, covers almost a new ground. There is hardly any study available in the field of extension education directly related to the present one. The possible reason may be that pulses remained neglected in the past. They did not find a significant place even in our agricultural planning. It is only since last few years that they are receiving due attention on the part of all concerned. Even general observation and comments with respect to pulse cultivation are very limited in size and dimension. Therefore, the present study would serve as a pace setter, so far as extension research with respect to pulses is concerned. The relevant literature having a direct or indirect bearing on the present study has been presented in the following sub-section.

3.1 Size of holding and adoption level.
3.2 Adoption level.
3.2.1 Adoption level of production technology.
3.2.2 Relation between independent variables and adoption of recommended practices.
3.3 Technological gap in the adoption of technology.
3.4 Relationship and contribution of communication variables towards technological gap.
3.5 Attitude towards adoption technology.
3.6 Constraints coming in the way of adoption of improved technology.
3.7 Suggestions for promoting the adoption of production technology.

3.1 Size of holding and adoption level

Kumari et al. (1981) concluded that size of land holding was positive and significantly related with the adoption of recommended agricultural practice.

Joshi and Shinde (1984) observed that size of land holding had a significant association with the adoption of improved farm practices.

Choudhary et al. (1988) also reported that there was an association between size of land holding and adoption levels.

Wasnik (1988) found that education, caste and land holding were not totally related with the adoption of dry farming practices.

Hanchinal et al. (1991) reported that the farmers having higher land holding status usually have better socio-economic status. According to cancean's theory 'Rank inhibits risk taking' that is increase in the status of the farmers, would enable him to endure higher risk, lower rank of the farmers in the society will inhibit the degree of risk taking. Better financial resources enable an individual to invest for different specialised farm operation of modern agriculture. Therefore, as the risk bearing capacity and financial strength are closely related with higher land holding status of farmers, it appears to be an important factor associated with the adoption of recommended cultivation practices.
3.2 Adoption level

3.2.1 Adoption level of production technology

After independence, government of India made large scale efforts to Transform the rural economy. The main stress was given to the development of agriculture. The farmers were motivated through various programmes to adopt improved agricultural practices to increase agricultural production. Some of them adopted many of the practices while many other, only few and some did not at all, that too in same area. Such differences in adoption of practices among the farmers naturally raise several questions. What are the reasons for so different a behaviour among the farmers? What could be the facts that influenced their behaviour so differently? To find possible answers to these and many other questions it may be necessary to look into the previous researchers conducted, by various researchers and to relate them with the present study.

Hebber et al. (1981) in their study "Adoption of new technologies in dry land ragi crop production" examined the extent of adoption and the reasons for non-adoption and reported that as many as 64 per cent farmers adopted improved varieties, about 79 per cent of the farmers applied fertilizer, though the dose was much less than the recommended dose, 84 per cent of the farmers used iron plough and the use of seed drill was adopted by 29 per cent of the farmers with none of the farmers using seed cum-fertilizer drill.

The programme Evaluation Organisation (1981) reported that 92.4 per cent farmers adopted the improved varieties of rapeseed-mustard,
80.2 per cent of the recommended seed rate and 41.2 per cent adopted the irrigation practice in rapeseed-mustard.

Bhaskaran and Praveena (1982) studied the knowledge and extent of adoption of improved dryland agricultural practices in respect of sorghum (jowar) and castor in Andhra Pradesh. The authors reported that in case of jowar the maximum adoption was 42 per cent. Improved seed, summer tillage, correct time of sowing and spacing, correct seed rate and interculture were grouped into 31 to 42 per cent whereas in case of seed treatment, fertilizer used, chemical control of weeds and plant protection measures the adoption index varied from 1.5 per cent to 26.5 per cent.

Singh and Mathur (1982) observed that in most of the package of practices of bajra, the gap with respect to potential and extent of adoption (P.E.) ranged between 0 to 100, meaning thereby that some of the farmers have not at all adopted the specific components of technology and hence it demands immediate attention of extension workers. The researcher suggested that special care of plant protection and better use of P and K fertilizers should be taken in order to harness the potentiality of hybrid bajra.

Guliani et al. (1983) reported that there was complete adoption of recommended varieties of Raya by 96.55 per cent farmers whereas 3.45 per cent farmers adopted the improved varieties partially. All the farmers (100%) followed the recommended sowing method and 58.62 per cent adopted the recommended sowing time. Only 10.34 per cent farmers used the recommended quantity of seed rate and the same percentage
followed the seed treatment practice. In case of N-fertilizer, the adoption level was 58.62 per cent. It was 20.68 per cent in case of phosphatic fertilizers. However, only 5.88 per cent farmers applied the recommended doses of N-fertilizers. The plant protection measures to control mustard aphid were taken by cent per cent (100%) farmers and manual weeding was done by 11.11 per cent farmers. Although 75.0 per cent farmers irrigated the crop but only 9.0 per cent farmers applied the recommended number of irrigations.

Singh and Mathur (1984) found that poor knowledge about application of nitrogenous fertilizers resulted into partial adoption of this practice. Small and medium farmers felt lack of knowledge as most serious constraint with respect to use of plant protection measures in bajra cultivation.

Verma (1985) reported that the adoption level of recommended rape-seed mustard production technology among the farmers was found to be quite satisfactory with regard to agronomic practices, in general, and improved varieties in particular. It was 76.2 per cent for plant protection measures too. The adoption of manurial practices was not upto the mark.

Jaiswal et al. (1986) found that a majority (69%) farmers were using improved seed. Percentage was highest (53%) among big farmers and lowest (44%) among small farmers. As regards fertilizers, about 75 per cent of sample farmers used fertilizers. The percentage which used fertilizer was highest among big farmers (93%) followed by medium
farmers (65%). It was observed that a majority of small farmers in Bara block did not use chemical fertilizers. Only 60 per cent of the farmers used pesticides and it was confined only to big farmers.

They further stated that the percentage of adoption was very high (94%) with regard to improved practices among the farmers. It was significant that almost all farmers adopted the practices which they learnt from V.L.Ws.

In the context of paddy they found that very few farmers adopted recommendations such as number of plants per hill (4%), sowing time (6%), plant to plant distance (8%), row to row distance (19%), selection of seed (23%), seed rate (35%). None of the small farmers were seen to correctly adopt the recommendations. The proportion of contact and non-contact farmers adopting these practices was the same. About four-fifth of the farmers used chemical fertilizers, the category wise figures were 62 per cent, 82 per cent and 92 per cent for small, big and medium farmers, respectively, but the correct time of application was adopted only by five per cent of the sample farmers.

Plant protection measures were adopted only by six per cent farmers, whereas chemical weed control was confined to 20 per cent of the sample.

In the case of wheat majority of the farmers (68%) used the recommended seed rate. There was no significant different between contact and non-contact farmers. About half the sample farmers followed the recommendations on timely sowing. Over three quarters of the sample
farmers had been found to use chemical fertilizers on wheat and about 45 per cent to perform timely weeding operation but only seven per cent used weedicides.

They further stated that there was a difference among farmers in adoption of the improved practices. The average adoption was: 35 per cent for the big farmers, 27 per cent for medium and 18 per cent for small farmers.

Singh et al. (1989) reported that in the case of HYV of paddy among contact farmers 52 per cent were high adopters, 24 per cent were medium and 24 were low adopters. In case of seed treatment 56 per cent were high adopters, 14 and 30 per cent were medium and low adopters, respectively. As far as the application of chemical fertilizers was concerned, 12 per cent of contact farmers were high adopters, 22 per cent and 36 per cent were medium and low adopters, respectively. In case of weedicide application only four per cent were high adopters, eight per cent medium and 88 per cent were low adopters.

Saxena et al. (1990) found that only 17.6 per cent farmers have adopted the package of wheat under rained conditions in full while majority of the farmers, i.e. 49.6 per cent have adopted partially and 32.8 per cent have followed the recommendations to the minimum level of their fields, whereas improved varieties were adopted by 68.72 per cent respondents but the plant protection and application of recommended doses of fertilizers have been adopted by very less percentage.

Chandargi et al. (1991) found that 95 per cent farmers adopted
varieties fully whereas chemical fertilizers was partially adopted by 36 per cent and fully by only five per cent farmers and 59 per cent did not adopt it at all. Similarly, none of the farmers had adopted pest and disease control measures.

They further observed that education, land holding and communication net work were found to have non-significant association with adoption pattern of recommended jowar cultivation practices.

Hanchinal et al. (1991) found that 53 per cent potato growers fell under high adopter category and 47 per cent under low adoption category. Similarly, 99 per cent farmers adopted fully seed varieties, whereas fertilizers were adopted fully only by 14 per cent and 39 per cent did not adopt at all. The pest and disease control was adopted fully by only 17 and 15 per cent respondents.

They further observed that education status and land holding status of the respondents had significant association with adoption pattern whereas mass media participation has non-significant association.

3.2.2 Relation between independent variable and adoption of recommended practices

Age

The research results so far available indicate conflicting views of the workers about the relationship between age and adoption. Sonaria and Sharma (1983), Joshi and Shinde (1984) and Chaudhary et al. (1988) concluded that age played a significant role in the adoption of high yielding varieties.
Joshi (1985) found that farmers' age and extent of adoption were independent of each other.

Wasnik (1988) reported that age was related with technology adoption and concluded that as the age increased with their experience in farming they could take risk.

Katarya (1989) found negative and significant association with adoption.

Rade et al. (1990) reported that the majority of middle and old age group of farmers had high level of constraints. However, the age of the farmers was found to be significantly associated with the level of constraints.

Supe et al. (1990) observed that the age of the farmers had no relation with their adoption behaviour.

**Caste**

Mishra and Sinha (1981) found that caste had not played a significant role in adoption of recommended agricultural practices.

Singh (1984) reported that there was no significant relationship between caste and adoption of recommended agricultural practices.

Singh and Patel (1988) also found that there was significant relation between caste of non contact farmers and their extent of adoption. Whereas there was not relationship between caste of contact farmers and their extent of adoption of improved practices.
Education

Sodhi and Kherde (1980) and Katarya (1989) stated that higher the farmer's level of education higher was the adoption of improved technology.

Joshi (1985) and Kubde and Kalantri (1986) reported a positive association between level of farmers' education and extent of adoption.

Rade et al. (1990) stated that as the education level goes on increasing, the percentage of farmers in high level of constraints goes on decreasing. The author further indicated that the education was significantly associated with the level of constraints.

Family size

Katarya (1989) found that the remaining characteristics, like caste, family type and size did not show any significant relationship with adoption.

Saxena et al., 1990 observed that size of family had no association with acceptance of the technology.

Social participations

Chaudhary (1982) observed no significant relationship between social participation and adoption of recommended agricultural practices.

Bhoite and Nikalje (1983) found that social participation was positively and significantly associated with adoption of improved package of practices.
Singh (1984) reported a significant association between social participation and adoption of improved agricultural practices. However, Sharma (1986) found that there did not exist a relationship of significant level between social participation and adoption of recommended practices.

Singh and Patel (1988) reported that a significant relationship between social participation of contact farmer and their extent of adoption. According to Rade et al. (1990) social participation was not significantly associated with the level of constraints in adoption.

Socio-economic status

Sohi and Kherde (1980) reported that socio-economic status was positively and significantly related with the adoption of recommended practices for agricultural production.

Bhoite and Nikalje (1983) and Singh (1984) found that there was a positive significant association between socio-economic status and adoption of recommended agricultural practices.

Sanoria and Sharma (1983) observed a significant relationship between the socio-economic status and adoption in case of training and visit and control group beneficiaries.

Supe et al. (1990) reported significant relationship between adoption and socio-economic status of the dryland farmers.

Knowledge level of production technology

Bhaskaram and Parveena (1982) reported that farmers had a low knowledge about seed treatment, fertilizer, chemical weed control
and plant protection measures.

Nirwal (1982) found that the mean knowledge score of irrigated holding farmers was 8.15 and with unirrigated holding was 3.78 in case of gram. He has further reported that the farmers having irrigation water had invariability significantly higher knowledge than the farmers having holding without irrigation.

Singh (1986) found that mean knowledge scores of both crops (gram and bajra) was very low. But the difference in the farmer's knowledge of gram and bajra production technology was significant.

Sharma (1986) found that maximum percentage of the respondents (36.0%) carried medium level knowledge of recommended agricultural practices. Those who belonged to low and high knowledge categories were 34 and 30 per cent, respectively.

Sagar and Ray (1986) found that farmers' knowledge about plant protection is an essential component in determining the productivity of crops.

Panjabi and Lakhera (1988) and Vijayraghavan and Somasundaram (1979) reported that socio-economic status had positive and significant relationship with the knowledge.

Kher and Halyal (1988) observed that education, social participation, farm mechanisation index, adoption index, innovation proneness, extension participation index and localite-cosmopolite value orientation were positively associated with sugarcane growers' knowledge about
Singh (1989) found that farmers' knowledge was to the extent of 41 per cent of the total vegetable production technology. The crop-wise knowledge level in the production technology also indicated that farmers had high level of knowledge about potato (0.98) and tomato (0.94) and tomato (0.94) in comparison to onion crop (0.77). In case of potato, farmers' mean knowledge level was high in agronomic practices (1.63) followed by storage practices (1.04). But their level of knowledge with respect to manurial (0.91), plant protection (0.59) and seed production (0.74) practices was relatively low. In onion, the farmers had higher level of knowledge in agronomic practices (1.46). The mean knowledge level about manurial (0.84) and plant protection (0.66) practices was relatively low. However, they had very low level of knowledge about storage practices (0.13). In tomato, farmer's knowledge about agronomic practices was much higher (1.82), but their knowledge about plant protection practices was very low (0.28).

3.3 Technological gap in the adoption of technology

Singh (1986) observed that the extent of adoption of improved production technology recommended for dry farming conditions in case of gram and bajra crop was very low. That is, the adoption gap was high in gram and bajra crop. However, the extent of adoption was high in case of bajara production technology than that of gram.

Gangwar and Yadav (1986) in a study on economic analysis of pulses (gram) in Haryana state, found that only 4 per cent of the
farmers used the rhizobium culture in gram and 20 per cent of them adopted the weed control measures.

Bhoite and Tharat (1987) revealed that the three crucial factors viz. water management, nutrient management and disease and pest management were together responsible for 50.6% of yield gap. The ecological factors like temperature, soil and rainfall together contributed to 19.8% of the yield gap.

Tyagi and Tyagi (1988) studied that education and credit were the most important determinant of technological gap in small farmers. Credit orientation was important in medium farmers. Among big farmers, education and family type were most important in sugarcane cultivation.

Singh and Sharma (1990) reported that the recommended irrigation practices were followed by 31-39 per cent of the total respondents. The data on weed control showed a technological gap of 60.83, 56.22 and 46.96 per cent in case of marginal, small and medium farmers respectively. Further, plant protection was attended by 50 per cent of medium farmers whereas, small and marginal had a technological gap of 70-76 per cent.

Prasad and Mahipal (1991), reported that the adoption level as well as technological gap was found to be 'medium' among the respondents indicating the non-adoption of some of the recommended practices.

Vasanth Kumar and Singh (1991) found that majority of the small farmers reported low input gap (90.39 per cent), moderate credit
gap (74.01 per cent) and low technological gap (83.28 per cent).

3.4 Relationship and contribution of communication variables towards technological gap


Perinbam (1981) noted that most of the general farmers acquired information from their contact farmers followed by VLWs, friends and neighbours similar was the observation of Bhaskaran (1983).

Saha (1983) reported the VLWs hold group meetings as a routine without much utility. Only few charts on insect attack on crops are used and no other A.V. aids.

According to M.E. report No.8 (1983), 46 per cent farmers received advice from extension agencies (VLWs), 20 per cent from fellow farmers seven per cent from other sources and 27 per cent did not get any advice.

Menon (1983) revealed that main sources of information for more than three-fourth of farmers are the VLWs followed by agricultural officers and Assistant Directors of Agriculture. In addition, they received information through radio and newspapers.

Nandapurkar and Kulkarni (1985) observed that field days were
the most popular method of communicating technology. Some other methods used were minikit trails, demonstrations and mass media.

Sharma and Sanoria (1983) reported that use of local communication sources was higher among non-contact farmers than contact farmers, however, institutional communication sources were used more by contact farmers than the non-contact farmers used mass-media less than other types of sources/channels. Contact with extension agency personnel was far more among contact farmers than non-contact farmers.

Singh (1983) reported that all farmers make equal extension contact but very low farmers are exposed to no more than one or two extension methods. All categories of farmers had a very poor access to mass-media.

Amalraj and Prasad (1984) found that major source of information on new farm technology among farmers were Agricultural Extension Officials (26.4%), other farmers (24.2%), while farmer's union and fertilizer dealers were used by 16.5 per cent and 16.8 per cent farmers, respectively, followed by gram-sevaks (9-15%) of farmers.

They further observed that 'fertilizer dealers' as sources of information were being mostly utilized by small farmers (46.6%) followed by marginal farmers (43.4%) and big farmers (10%). They also found that the farmers of age group of 40-50 years with secondary level education and having medium income level were the most in contact with the fertilizer dealers.
Sherief (1985) found that generally farmers gave first position to 'other farmers' and news papers has source of information followed by contact farmers and radio, ADOs and agricultural scientists.

Feder and Slade (1986) reported that the crop yields for farmers whose main source was the extension services were found to be higher than those who learned mainly from other sources.

Jaiswal et al. (1986) revealed that about two-third of big and 50 per cent of small farmers learnt about improved practices through VLW. About 76 per cent learnt about new varieties, 31 per cent about fertilizers, 13 per cent about method of sowing and 20 per cent about pesticides from V.E.W. use of mass method was very poor in the study area. Only 30 per cent of small farmers learnt about improved seeds from radio, 7 per cent about fertilizer, 26 per cent contact farmers learnt about improved seeds through group meetings, 38 per cent farmers learnt through film shows on improved seeds, fertilizers and pesticides arranged by VLWs and 35 per cent farmers learnt of improved seeds through result demonstrations arranged by VLWs.

According to Sharma and Gaur (1987) and Padheria (1989) VLW obtained the first rank in cases of all the practices of all the four crops bajra, paddy, cotton and wheat and the next important source for the four crops was neighbours and relatives and very small portion of farmers obtained information through demonstrations. In case of wheat some role of informing had been played by research stations and literature also.
Punjabi (1989) observed that as a source of information farmers gave top priority to VEWs and supervisors were given second priority while scientists of university were placed at third position. The other sources like neighbours, progressive farmers, friends and village leaders were utilized by a very little members of farmers and were placed, fourth fifth, sixth and seventh in rank order. Among the channels, top priority was given to radio, second to demonstrations and third to exhibitions.

Waghdhare and Wakde (1989) reported that the main information sources reported by farmers were extension personnel weakening and T and V system (78.12%) followed by Shetkari maginl (43.75%) PKV (37.50%) and television, radio, newspapers etc. (28.12%).

Gadewar (1990) reported that non-contact farmers of both the villages rated VEWs to be either credible source of information. Radio is rated to be the most credible source of information. Newspapers and televisions were rated as the second most credible source. Farm magazine is placed fourth in Kolambi village while seventh in Saoli village. The contact farmers were given third position in Saoli village, while fifth in Kolambi village. Friends and relatives were given sixth and fifth in Saoli and seventh and sixth in Kolambi. In all cases, mass media had edge over all other information sources. He further observed that in the case of practices involving specialized technical knowledge, farmers tend to learn from knowledge primary sources, such as extension agents.

Singh and Prasad (1990) found that out of eight sources of information farmers gave highest choice to demonstrations, followed by extension personnel of state Department of Agriculture. The reliance
by farmers was placed on farm magazine as source of information.

Further it has been observed that the local leaders and other local sources of information have been rated very low for seeking information.

Baldeo Singh (1990) findings that the contact of extension agencies and mass-media were found to play major role in influencing Knowledge, attitude and adoption behaviour of farmers. This may be made more effective and regular by means of audio-visual aids, field visits, exhibitions, Kisan Melas, etc.

Baldeo Singh (1990) stated that proper communication pattern appeared to be the main reason for agricultural backwardness of the area. Therefore, the communication pattern within the client system should be developed. Local leadership should be encouraged by extending proper guidance and training to village headmen and village secretary.

Bavalatti and Sundaraswamy (1990) findings that the training should be given to large number of farmers about improved dryland farming practices for higher adoption. Since the adoption of dryland farming practices was significantly associated with extension participation. The extension agency should try to implement the dryland farming practices for higher adoption. Since the adoption of dryland farming practices was significantly associated with extension participation. The extension agency should try to implement the dryland farming practices on "water shed basis."
Saxena et al. (1990) reported that the farmers who own larger size of holding, belong to high caste category and educated have adopted the practices to a greater extent, but majority of small farmers who are illiterate still needs a greater attention of extension agencies to motivate them for adoption of scientific recommendations.

3.5 Attitude towards adoption technology

Sinha et al. (1984) observed that the attitude was significantly and positively associated with education, economic, motivation, extension contact, socio-economic status, occupation and social participation, while with age, it was negatively associated. The association of attitude with scientific criterion, risk preferences and farm size were non-significant denoting thereby that these factors played non-significant role in the formation of attitude.

Singh (1988) revealed majority of the farmers (contact and non-contact) had favourable attitude towards T and V system. However, no significant difference was recorded between the attitude of contact and non-contact farmer.

Buttar and Goyal (1989) observed that knowledge was as much related to attitudes as the latter to practices. This asserts the knowledge asserts influence on practices due to attitude change resulting from it. Since knowledge and attitudes are closely related both asserts influence on practices.

Baldeo Singh (1990) stated that the low average knowledge and slightly favourable attitudes of farmers indicates that there is a
need to develop proper extension teaching methods to impart useful agricultural knowledge to the farmers in abundant measures.

3.6 Constraints comming in the way of adoption of improved technology

Waghmare and Pandit (1982) reported that the lack of knowledge and lack of technical guidance about new varieties were the main constraints in use of improved variety and seed treatment. In case of method of sowing, educational constraints followed by practical, socio-cultural and economic constraints were the main constraints. Lack of knowledge, lack of technical guidance and high cost of chemical fertilizers were expressed by majority of the respondents as major constraints in application technology of chemical fertilizer.

Baadgaonkar and Venkataramaiah (1983) reported that the reason for partial adoption and non-adoption of chemical fertilizers, seed treatment plant protection chemicals were either their non-availability or financial difficulties or high cost.

Satapathy and Raj (1983) reported the constraints in adoption of pulse technology among marginal, small and big farmers of Orissa and also included SMSs and VLWs to make the findings more rationale. The findings revealed that main constraints in adoption of recommended package of practices in pulse cultivation were: farmers' ignorance, non-availability and high cost of inputs, lack of timely technical advice and guidance and poor economic return as perceived by pulse growers.

Dadhwal et al. (1983) found lack of awareness about HYV's,
non-availability of improved seeds at proper time, procurement of inputs not at proper time, negligence of plant protection measures, gaps in technology and its proper communication, poor knowledge of post-harvest technology, lack of credit facilities, socio-economic problems, to be the main constraints in getting higher yields at farmers' fields.

Guliani et al. (1983) reported the constraints in adoption of improved technology of gram and rapeseed mustard. They reported that lack of awareness of improved varieties and non-availability thereof within the reach of common farmers were the two important constraints in the adoption of recommended varieties. The lack of conviction of superiority of recommended quantity was the major reason for non-adoption of recommended seed rate in case of mustard crop. Farmers used less than the recommended quantity of seed and their conviction was that if more seed is used, it leads to dense crop stand, branching is reduced, stem remains weak and fruiting is less.

Regarding the non-adoption of chemical fertilizer in case of gram and mustard, the reasons reported were: fear of loss due to drought and shortage of capital. In case of mustard, farmers' conviction was that there is no need to use chemical fertilizers after the application of FYM. The reasons reported for non-adoption of plant protection measures were the lack of awareness about the recommended pesticides and exact quantities recommended, high cost of pesticides and non-availability of plant protection equipments. Regarding inter-culture practices the farmers did not adopt these because of their lack of conviction of utility of this practice and lack of interest among the farmers.
Singh (1983) revealed that the main constraints in the production of coarse grains and pulses were low fertility of land, use of local or desi seeds, less use of water and fertilizers, low yield potential of varieties, less remunerative (due to low yield), erratic rainfall and risky nature of crops. It was also observed that there was no use of fertilizers on any size of holdings in barley, gram and other pulses.

Singh (1984) observed that major constraints pertaining to inputs were cost of weedicides, pesticides, fungicides (96.0%), high cost of fertilizers and high cost of HYV's of paddy seeds (91.0%) and non-availability of HYV's of paddy seeds (72.0%).

Kunnal et al. (1984) observed that high costs of various agricultural practices for different crops affected the adoption by farmers. He further reported that lack of awareness was the main reason for not using the improved varieties.

Singh and Mathur (1984) observed that due to uncertainty of weather and crop failure, farmers did not care to adopt recommended package of agricultural practices.

Verma (1985) concluded that technological recommendations with respect to a crop has not to be made considering the needs and constraints of a crop in isolation of the needs and constraints of other crops, grown in the area in the same season. The scientists may have to see the whole cropping system in a season as an interdependent system and recommendations with respect to different crops may have to be made accordingly.
Joshi (1986) expressed in the study of sugarcane cultivation that difficulties faced by the farmers in adoption of recommended dose of fertilizer were untimely supply, unavailability of required fertilizers, need investment for longer period, inadequate supply and high price. He further reported that in adopting the plant protection practices constraints such as lack of equipments, difficulties in spraying, ineffective as neighbours do not adopt, complicated method, low price of produce, lack of guidance and unaware of diseases and pests were stated by the respondents.

Kothicane et al. (1987) observed that constraints namely, high cost of inputs like fertilizers, pesticides non-availability of inputs at proper time and inadequate quantities, low prices to farm produce were the major constraints. The constraints regarding utilization of irrigation water were perceived equally important by farmers. They further opined that systemic scheduling of irrigation water will facilitate to increase the agricultural production and income thereby help in minimizing technological gap under irrigated farming system.

Lal (1989) found that the lack of advise and guidance (68.49%) ranked first constraint in the sugarcane production technology followed by ignorance about improved varieties (52.58%), non-availability of improved seed (47.08%), crushing (44.25%), high investment in plant protection (41.99%), transportation (28.85%), non-availability of labour (27.41%), non-significant increase in yield (24.16%), high initial investment (22.75%) and ineffective improved technology (21.75%).
Singh and Sharma (1990) found that some of the major constraints were lack of finances for purchase of inputs (84%) and lack of knowledge (81.7%) high cost of HYVs seeds (75.09%) shortage of irrigation facilities (61.00%). The other constraints included non-availability of inputs on time (58.76%) followed by incidence of pest and disease (48.00%).

Girase and Kamble (1991) expressed that (87.50 per cent) did not adopt any plant protection measures for bajra crop. The study revealed that among the non adoption of plant protection measures, 35.00 per cent did not adopt due to high cost of insecticides and pesticides, 21.75 per cent did not adopt because of lack of knowledge regarding use of pesticides, which pesticides? Insecticides, when and how much to use. About 21.25 per cent of them did not adopt plant protection measures due to non-availability of plant protection equipments.

Girase and Kamble (1991) stated that 80.00 per cent respondent had not applied fertilizers for bajra crop under dryland condition. 30.00 per cent did not adopt because fertilizers were very costly. About 15.00 per cent did not adopt due to lack of knowledge, when and how much to use. The 17.75 per cent did not apply, use of fertilizer in dryland farming was not profitable. Non-availability of fertilizers in time was reported by 10 per cent, while 6.25 per cent did not use fertilizers due to uncertainty of rainfall.
3.7 Suggestions for promoting the adoption of production technology

Sinha and Sinha (1980) suggested that credit should be provided to the farmers in time so that they can purchase agricultural inputs like seeds, fertilizers, insecticides, pesticides etc., in time.

According to Jeswani and Saini (1981) improved and short duration varieties of various pulses along with appropriate production technology developed through research efforts, warrant immediate adoption by the farmers. There has been a wide gap between the production potential of improved technology and the national average of productivity in pulses. For instance the improved varieties of gram like 'Annegeri', 'H-208' gave 20-24 qts/ha yield as compared to 10-15 qts/ha of local varieties under identical conditions in farmers' fields. It has also been observed in experiments in farmers' fields that the improved management practices such as use of bacterial culture, phosphatic fertilizers, weeding and plant protection measures bring 60 per cent additional production of pulse crops. Thus, to bridge the gap between the yield potential of improved production technology and the yields being obtained in farmers' fields, the improved varieties are to be popularized with the back up of seed production programme and timely availability of inputs to the farmers.

According to Saini (1981), there has hardly been any research on post-harvest technology. He observed that a significant percentage of the country's produce is lost during and after harvest. He further stated that the scientific way to produce more pulses should include
steps like selection of proper variety, planting time, cropping pattern, fertilizer application, inoculation with rhizobium, irrigation, drainage, weed control and plant protection measures.

Swaminathan (1981) while delivering his key-note address at the workshop on Grain Legumes Organised by the Protein Food and Nutrition Development Association of India suggested organisation of pulse villages in both irrigated and non-irrigated tracts to solve the problems of stagnating production and difficulties in storage, processing and marketing of pulses. He further suggested that a village or a cluster of contiguous villages could be adopted where all inputs like good seeds, irrigation, weed control, pest control and producer marketing techniques could be provided. He observed that good tools are available for analysis of the causes responsible for stagnation in production but no tools for effective action.

The above review of literature emphasises expansion of area and adoption of package of practices for increasing the production and productivity of pulses. A detailed statement of suggested strategies cited in this section is given here to draw an overall view about the possible measures to increase pulse production in our country.

An overview of the review of literature cited in this section leads to the conclusion that most of the expressions are evaluative in nature. Few experimental studies in field conditions have been reported from agronomical point of view. There has been no extension research on these group of crops on any dimension. The present investigation,
Table 4. Classification of suggested strategies

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Suggestions</th>
<th>Mentions</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Expansion of area under pulses</td>
<td>10</td>
<td>30.30</td>
</tr>
<tr>
<td>2.</td>
<td>Check in shifting of area under pulses to cereals</td>
<td>2</td>
<td>6.06</td>
</tr>
<tr>
<td>3.</td>
<td>Sound research</td>
<td>4</td>
<td>12.12</td>
</tr>
<tr>
<td>4.</td>
<td>Seed production programme</td>
<td>4</td>
<td>12.12</td>
</tr>
<tr>
<td>5.</td>
<td>Improved varieties</td>
<td>10</td>
<td>30.30</td>
</tr>
<tr>
<td>6.</td>
<td>Supply of quality seeds</td>
<td>11</td>
<td>33.33</td>
</tr>
<tr>
<td>7.</td>
<td>Adoption of full package of practices</td>
<td>10</td>
<td>30.30</td>
</tr>
<tr>
<td>8.</td>
<td>Sowing time</td>
<td>2</td>
<td>6.06</td>
</tr>
<tr>
<td>9.</td>
<td>Application of rhizobium culture</td>
<td>5</td>
<td>15.15</td>
</tr>
<tr>
<td>10.</td>
<td>Optimum plant population</td>
<td>1</td>
<td>3.03</td>
</tr>
<tr>
<td>11.</td>
<td>Cultural operatons</td>
<td>1</td>
<td>3.03</td>
</tr>
<tr>
<td>12.</td>
<td>Weed control</td>
<td>4</td>
<td>12.12</td>
</tr>
<tr>
<td>13.</td>
<td>Fertilizer application</td>
<td>8</td>
<td>24.24</td>
</tr>
<tr>
<td>14.</td>
<td>Irrigation provision</td>
<td>11</td>
<td>33.33</td>
</tr>
<tr>
<td>15.</td>
<td>Plant protection measures</td>
<td>13</td>
<td>39.39</td>
</tr>
<tr>
<td>16.</td>
<td>Multiple cropping</td>
<td>10</td>
<td>30.30</td>
</tr>
<tr>
<td>17.</td>
<td>Inter-cropping</td>
<td>11</td>
<td>33.33</td>
</tr>
<tr>
<td>18.</td>
<td>Sound extension approach</td>
<td>10</td>
<td>30.33</td>
</tr>
<tr>
<td>19.</td>
<td>Change in belief that pulses do not require better management practices</td>
<td>2</td>
<td>6.06</td>
</tr>
<tr>
<td>20.</td>
<td>Price support</td>
<td>6</td>
<td>18.18</td>
</tr>
<tr>
<td>Sl.No.</td>
<td>Suggestions</td>
<td>Mentions</td>
<td>Percentage</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>21.</td>
<td>Subsidy</td>
<td>3</td>
<td>9.09</td>
</tr>
<tr>
<td>22.</td>
<td>Input supply</td>
<td>2</td>
<td>6.06</td>
</tr>
<tr>
<td>23.</td>
<td>Credit provision</td>
<td>2</td>
<td>6.06</td>
</tr>
<tr>
<td>25.</td>
<td>Keeping of correct statistics</td>
<td>2</td>
<td>6.06</td>
</tr>
</tbody>
</table>

Total citations of review 33

therefore, will serve as a first step in pinpointing the various aspects of pulse crops which need to be investigated into. The study has been designed to make a multi-disciplinary approach to the problems of pulse production in our country.

Bhaskaran and Praveena (1982) observed that the knowledge and adoption levels of certain crucial recommended practices like fertilizer application, plant protection measures, soil and water conservation measures specially with reference to minimal irrigation were not upto the mark. The authors suggested that extension staff should, therefore, bestow more attention on them and see that the farmers gain a sound knowledge, and the associated skills. This can be achieved by appropriate skill-oriented trainings and multiplying the efforts over wider areas.
Singh (1984) observed that the farmers usually apply insecticides immediately on appearance of the insect regardless of their population. They should be advised to take into account the extent of pest-build up. It would be uneconomical to use pesticides in a crop if the pest population is below the economic damage threshold. He further observed that one of the problems, the farmers are faced with was the availability of good quality genuine pesticides. It cannot be denied that there is rampant adulteration and production of sub-standard pesticides.

Amberman (1985) suggested that storage facilities should be provided to the farmers at reasonable cost to facilitate their produce to be kept without getting deteriorated.

Bhatia and Yawalkar (1985) suggested that regulated marketing facilities should be extended to all commodities of agriculture, horticulture, apiculture, sericulture, pisciculture, poultry, livestock and livestock products and forest produce.

Bansil (1985) suggested that if India was to continue for technological and economic progress, it was necessary to increase the supply of technical and scientific manpower in a most effective manpower to the farmers.

Sagar and Ray (1986) reported that the cultivation of high yielding varieties as such may not give high yield unless the farmers acquired more knowledge about plant protection. Therefore, it is essential to train the farmers thoroughly in the principles and practices of plant protection. They also suggested that the farmers should be
trained and motivated to use fertilizer as per recommended dose.

Nikhade et al. (1987) advocated that beliefs play a major role in adoption of improved farm practices. The farmers having strong faith on beliefs adopted comparatively very few practices. The author suggested that in extension planning the extension workers and other planners should think in this direction so as to wipe out the impact of barriers on adoption.

Arya and Rawat (1990) indicate that increase in area under cereals at the cost of pulses and oilseeds has to be curbed. The high-yielding and location specific varieties of seeds, availability of assured irrigation, fertilizer and plant protection inputs should also be made available to crops like pulses, oilseeds and cotton which are largely grown in arid areas. A lucrative price declared in advanced may support increased land allocation and cropping intensity.

Kennedy et al. (1990) suggested that calls for immediate need to propagate the importance of adopting recommended variety of quality seed. Supply of quality seed in required quantities and adoptive demonstrations can help in a big way to boost up the pulses productivity and profitability.

Kadrekar (1991) stated that the production of pulses and oilseeds in the Konkan region could be increased with concentrated efforts with regard to proper technological back-up, diversification of cropping pattern, area extension, marketing and price support and appropriate extension efforts.