CHAPTER-V

SUMMARY AND SUGGESTIONS

Improvement in dry farming is a critical factor in the development of the economy of the country. A number of improved dry land technologies have been developed by the research institutes in order to increase the yield of crops grown in different arid and semi-arid parts of the country. The relevance of these technologies has been tested in large number of field demonstration. It has been established that production of dry land crops can be increased significantly by adopting improved dry land technologies.

However, the rate of diffusion of improved dry land technologies among the farmers have been quite slow and the gap between the technologies developed at dry land agriculture research stations and the farmers’ practices is quite wide. It is imperative to understand the reasons for the gap. It is also necessary to identify the factors that help or hinder the adoption of these innovations by the farmers. It was, therefore, proposed to undertake the present study of “Factors Affecting Adoption of Improved Dry Land Technology among the Farmers in Jodhpur District of Rajasthan” with the following objectives.

Objectives

The specific objectives of the study were to

1. Study the characteristics of the farmers in the dry land area.
2. Understand the operational details of traditional dry land agriculture practices among the farmers.
3. Understand the role of communication channels in adoption of improved dry land technology among the farmers.
4. Assess farmers’ knowledge and adoption level with respect to improved dry land technology among the farmers.
5. Identify the problems in adoption of improved dry land technology.
6. Study the farmers’ opinion about input management in the dry land.
7. Understand how far the different variables included in the study contribute to the adoption behaviour of the farmers.

8. Suggest suitable extension strategy for promoting the adoption of improved dry land technology.

Methodology

The locale of the study was in the arid zone of Rajasthan. The extreme paucity of rain naturally has led to agricultural backwardness. The study was conducted in a Community Development Block (CD) in Jodhpur which was purposively selected where the Central Arid zone Research Institute and the Agriculture Research Station, Mandor is located. Four villages were taken on the basis of distance from the headquarter of Community Development Block, Luni. Two villages were near to it and two villages were relatively far away. The design of the study was survey research. The respondents were marginal farmers, small farmers and big farmers who were selected on the basis of land holding size as per the definitions given by the Govt. of India. In each of the 4 villages, 60 farmers, 20 each from marginal, small and big farmers categories were selected, thus totaling 240 respondents. Data were collected from heads of the household through personal interview. Information regarding traditional agriculture practices were collected through discussion with the farmers and observation of the farming operations in their fields.

Major findings

The major findings of the study are summarized below:

Characteristics of the farmers

Socio-personal characteristics: Nearly half of the respondents were in middle age, less than 1/3rd were young and a quarter were old. One half of the big farmers and the marginal farmers and around 1/3rd small farmers were in middle age group.
A little less than half of the respondents were illiterate. The illiteracy was more among the small farmers than the marginal and the big farmers.

As far as family size is concerned one third of respondents had large size families and a little less than it had 'very large size' families. The percentage of very large size family was more among the big farmers than the small and the marginal farmers.

Agriculture and dairy were main occupation of the respondents. A four out of ten farmers also work as farm labourers. This occupation was found among all categories of farmers.

Majority of the farmers belonged to the backward caste. Two-third respondents participated in social organizations. The marginal farmers participated least in social organizations.

**Economic characteristics:** The average land holding size was 2.18 ha for the marginal farmers; 5.28 ha for the small farmers and 10.98 ha for the big farmers. They grew several crops, viz., pearl millet, green gram, sesame, cluster bean and moth bean. Pearl millet and green gram together had most of the area (75.50%) of the total area. Very less area (0.02%) was kept for grazing their animals. The area under fallow land was almost nil among the marginal farmers. Several animals – cow, buffalo, bullock, camel, goat, sheep and poultry were found of which cows were with most of the farmers. Tractors appear to have replaced the bullock power to a large extent.

Nearly three-fourths of marginal farmers and a little less than two-third of the small farmers had annual income up to Rs.20,000 which indicates that most of the farmers-marginal and small are below poverty line. One fourth of big farmers had annual income up to Rs.20,000. More than half of big farmers had pucca house while more than one third of marginal and small farmers had it.
Psychological characteristics: A little less than half of the respondents used credit for agriculture purpose. Credit usage was more among big farmers than the small farmers and the marginal farmers.

Almost all respondents (88.75 to 95.00%) did not plan any change in future in agriculture owing to limitation of rainfall and underground water. Almost all respondents possessed a high degree of self-reliance. The deferred gratification increases as land holding size increases. The respondents had high economic motivation and there was same level of economic motivation among different category of farmers. On the whole the respondents had very low level of aspiration due to poor natural resources of the area.

Traditional Dry Land Practices: A number of traditional dry land practices have been evolved by the farmers. These include crops, crop rotation, implements for weeding, threshing and winnowing and storage structure. They are very cautious about the sowing time and removal of weed. The various implements are locally made and very cost effective. Similarly storage structure of food grains are also cost effective and the farm ladies construct it.

Communication

Interpersonal channel: About half of the respondents used interpersonal channels (family members, friends, relatives, neighbours, progressive farmers, input dealers and sarpanch) of information about the improved dry land technology. There were little variation among different categories of farmers in this respect.
**Extension worker:** More than four-fifth of farmers belonging different farmers categories knew the VLW. However, only about one fourth of them had contacts with the VLW. The contact rarely resulted in learning about technical know-how on dry land farming.

As regards agriculture supervisor, only around one fourth of the farmers knew them and had occasional contact with them. Half of big farmers having contact with them learnt the improved dry land technology whereas this proportion was much less among the marginal and small farmers.

**Radio:** More than half of all respondents had radio sets. More big farmers than small and marginal farmers possessed radio sets. The frequency of listening among all categories farmers were broadly same.

About one-third of those who did not listen the agriculture programme had three reasons namely, (i) not possessing the radio set, (2) no interest and (3) lack of time.

Radio programmes on agricultural technology appear to be somewhat successful as nearly 30 percent respondents reported that they had learnt improved dry land technology through the radio.

**Television:** Only about a fifth of all the respondents possessed TV sets; this proportion was as expected, more for big farmers than the other categories.

Agricultural programmes on television have by and large failed to appeal to the farmers.

Only about one out of every ten respondents reported learning some improved dry land technology by watching TV. Among the reasons given by the non-viewing respondents for not watching TV, the more common were - 'no interest in watching agricultural programmes', 'not possessing own television set', and 'lack of time'. 
**News paper:** Only one-tenth of all the respondents subscribed to newspapers. Very few respondents reported learning about improved dry land technology from it as there was little coverage of agriculture in it.

**Extension method and Teaching aid:** Large number of respondents (60-80%) were never exposed to the extension methods and teaching aids.

**Knowledge of improved dry land technology:** All respondents were aware of number of ploughings, correct time of sowing and weeding to pearl millet and green gram as per recommendation. All respondents knew the improved variety of pearl millet and 66.25 per cent knew the improved variety of green gram.

More than half of respondents knew correct seed rate of pearl millet, while almost none had knowledge of correct seed rate of green gram. One-third of respondents could tell the correct dose of farm yard manure in pearl millet.

In case of pearl millet, less than one-fifth of all respondents knew the correct dose of nitrogenous fertilizers but nobody knew the same for phosphatic fertilizers.

In respect of green gram, very few respondents (14%) knew the correct dose of nitrogenous fertilizer and one-fifth knew the correct dose of phosphatic fertilizer.

None of the respondents knew the name of the chemical required for seed treatment nor the name of disease and fungicide of both crops. Half of the respondents knew the name of the insects of pearl millet but were not able to tell the insecticide for crops. 92 percent knew name of the insect of green gram and 77 percent knew the insecticide to control it.
The overall knowledge of the farmers about improved dry land practices of pearl millet was 60.54 percent and a little less (53 percent) for green gram.

The level of knowledge of the farmers was classified into three groups – low knowledge (less than mean -1 standard deviation), medium knowledge (mean + 1 standard deviation) and high knowledge (more than mean + 1 standard deviation).

Majority of the respondents had medium knowledge about the improved practices for pearl millet. The percentage having low knowledge was more among the marginal farmers than the small and the big farmers. With respect to green gram two-third of the respondents (67.50%) had medium knowledge. The percentage having high knowledge was more among the big farmers than the marginal and the small farmers.

**Adoption of improved dry land technology:** All farmers adopted number of ploughing, sowing time and weeding as per recommendations of pearl millet and green gram. Improved variety of pearl millet was sown by all farmers. Two-third of farmers sowed the improved seed of green gram. The adoption of improved seed of green gram among different categories of farmers was quite high, ranging from half to nearly three fourths for different categories.

In pearl millet adoption of seed rate was even to the extent of double of the recommended rate, but it was 25 to 100 per cent of the recommendation in green gram.

Most of the respondents used FYM in pearl millet. The percentage of marginal farmers (85%) applying it was a little less than big and the small farmers.

A small percentage the respondents applied the chemical fertilizers to the crops. Overall percentage of users was 27% in pearl millet where as it was 23% for green gram. It was extremely low among the marginal farmers and
low among the big farmers for both crops. In case of the small farmers, it was extremely low for green gram and low for pearl millet.

There was imbalance in the use of nitrogenous and phosphatic fertilizers to crops. In pearl millet more than 1/4th of the respondents used as low as 25 per cent of the recommended dose of nitrogenous fertilizers, more than 1/3rd used between 1/4 to 1/2 of the recommendation. There was over adoption of the nitrogenous fertilizers in green gram: 32.14 percent went beyond the recommendations to the extent of 76-100 percent. A significant percentage of the respondents from each category farmer applied high dose of nitrogenous fertilizer.

The use of phosphatic fertilizer was much better than the nitrogenous fertilizers. 36.72 per cent respondents applied 101-125 per cent in pearl millet and 33.33 per cent 76-100 per cent of the recommended in green gram. In pearl millet, the percentage of marginal farmers using less than the recommendation was 66.66 per cent while 45 per cent each was among the small farmers and the big farmers. For green gram, there was no difference in the percentage of the farmers using less quantity of phosphatic fertilizers (marginal farmer 62.50%, small farmer 60.00% and big farmer 63.10%).

None of the respondents treated the seeds of either of the crops. No insecticide were used in pearl millet. Three fourths of respondents applied it in green gram. All most all respondents applied very low quantity of insecticides.

Mean adoption score was 52 percent for pearl millet and 50 percent for green gram in other words.

The level of adoption of the farmers was classified into three groups – low adoption (less than mean-1 standard deviation), medium adoption (mean ± 1 standard deviation) and high adoption (more than mean + 1 standard deviation).

On the whole about two-third of the respondents were medium adopters of improved practices of pearl millet. More than two-third of the
respondents were medium adopters of the improved dry land technology of green gram. The marginal farmers were behind the other categories regarding adoption of the improved dry land technology of green gram also.

Problems in adoption of improved dry land technology: The recommended variety of green gram was not adopted mainly because farmers did not consider it better than local variety with respect to yield and vegetative attributes. Another reason was lack of money to purchase the costly improved seed.

The main reason for not applying FYM was non-availability of cow dung.

There were three main reasons for not using chemical fertilizers. The crops fail when there is low rainfall, the soils become infertile due to regular application of chemical fertilizer and lack of finance to purchase.

The seed treatment for pearl millet and green gram was not adopted as they had no knowledge of the method of seed treatment.

There was less attack of insect and disease in pearl millet. Lack of knowledge about control measures of insect and disease was a common problem for not using insecticide and fungicide for pearl millet reported by a little less than half of the respondents in case of insecticide and a little more than half of the respondent for fungicide.

In green gram also, a little less than half of the respondents attributed lack of knowledge about the control measure of insect for not applying insecticide.

One-third of the marginal farmers and one-fourth of the small farmers had no money for purchase of insecticide. Another reason was lack of reluctance to kill insect as they are also living creatures.
Very large number of farmers reported lack of knowledge for not using fungicide in green gram.

**Input Management:** Private dealers and Gram Seva Sahakari Samiti were the main source of supply of seed, fertilizer and pesticide. There was adequate supply of all inputs in time to the respondents. While most of respondents were satisfied with the quality of the chemical fertilizer and pesticide, one fifth of marginal farmers and one sixth of small farmers were not satisfied with the quality of the improved seeds. Most of farmers irrespective of the land size were dissatisfied with the cost of all inputs.

The respondents mentioned specific problems in respect of each input. High cost of seed was a major problem for all categories. Poor generation of pearl millet seed was reported around one tenth of small and marginal farmers.

A few farmers reported mixed seed, selling of old seed, small seed, false tag attached to the seed, need to travel long distance for purchase of the seed, low yield in drought year, damage of pearl millet by jowia disease-downy mildew, uneven height of pearl millet, small earhead of pearl millet, low germination of pearl millet and less height of green gram.

The high cost of chemical fertilizer and pesticide was the major problem for large number of farmers from all categories. A few big farmers reported poor quality chemical fertilizer (15.71%) and non-availability in time (10.52%).

The high cost was also major problem for large number of farmers for pesticide. A few big farmers (15.22%) reported poor quality of pesticide.

**Multi-variate prediction of adoption:** Multiple regression analysis was done to estimate the degree to which the adoption behaviour of farmers could be predicted by the 18 independent variables selected. The step-wise regression analysis – proceeding with 18 independent variables, yielded an regression analysis with only 7 variables. These seven were: social
participation, land holding, credit orientation, self reliance, interpersonal channel, input supply satisfaction and knowledge.

Of the seven, only two variables viz. knowledge and land holding were statistically significant. The total predictability was only 36. Between the two variables that was found to have significant influence on adoption behaviour, land holding size can not be changed at will. The other variable, knowledge of improved technology is a variable that can be manipulated significantly through intensive extension educational efforts. As per the analysis, therefore, it is possible to accelerate the adoption of farm technology by launching a vigorous, all out efforts to help the farmers learn about the details of the latest advances in dry land farm technology. Adequate knowledge will also motivate and inspire them to try and practice whatever is feasible in this situation. At that juncture, of course the developmental agency has to be ready with timely availability of good quality inputs in adequate amounts to fulfill farmers demands.

While 36% variation in adoption could be explained through the 7 variables this also means that nearly 2/3rd of the variables in adoption behaviour remained unexplained by these seven variables. This is an area of research in improving the prediction of adoption, since it will widen the scope of developmental interventions.

Suggestions
The study has pointed out that knowledge of improved dry land technologies has a great important role in adoption of improved dry land technologies. Thus, suggestions for an effective system for increasing knowledge of improved dry land technology among the farmers have been given. It deals with a methodology for field extension worker and the mass media below.

The field extension worker: The field extension worker has a great role in educating the farmers about the improved dry land technology because he is in direct contact with the farmers. It is he who educate the farmers in agriculture development. The designation of the field extension worker differs
from state to state. For convenience, the term Village-Extension Worker (VEW) used here. Below are guidelines for effectively educating the farmers about improved dry land technology.

Attributes: Educating to upgrade the knowledge and skill of farmers is a very delicate and difficult task. Since learning is voluntary and dry land areas have poor natural resources, several problems come in the implementation of the program. This calls for the VEW to have a genuine desire for the village welfare. It is quite clear that merely following the routine compliance to orders would lead nowhere. He should really be sincere, dedicated and friendly with the villagers and command their respect and confidence. He should also have patience. The visible results of his effort will give him a unique happiness. Thus what type of man is the VEW? What does he do? What does he hope for? These are the personal attributes that affect his image in the village resulting in success or failure of educating the farmers to a great extent.

Knowledge: It is essential for the VEW to have full knowledge of the farmers' background of the resources available to them and the local problems. This will enable him to relate the improved dry land technology effectively to their real life. Participatory rural appraisal, village records, census report and participation in religious ceremonies and wedding would provide useful information. He needs to understand local agricultural practices by discussing with the farmers and observing in the fields. He must know the improved dry land technology practices developed at the research station to become confident. He should visit the research station each year for three days to learn it. He should fix the program for discussion with the scientists. The items for discussion would include objective, methods of operation, uses, costs, impact and limitation of each improved dry land. After discussion, he should write down what he has learnt and should show his notes the next day to the scientists for improvement. The scientist should show the VEW the experiment plots. The VEW should discuss
the technical problems of dry land technology faced in the village with the scientists to seek practical solutions. The other sources of learning are books, newspapers, journals, radio and television. These should be provision for him to subscribe to local journal on improved dry land technology.

Extension methods and audio-visual aids are tools for disseminating the message to the farmers. The Extension Education Institute should conduct one-week or two-week courses to upgrade the knowledge of the VEW on extension methods and audio-visual aids. The training is best carried out in small groups.

**Individual contact**: The individual contact with the farmers affect greatly the process of adoption of improved dry land technology. It is not possible for the VEW to maintain regular individual contact with most of the farmers. He has to concentrate on a handful of farmers in each village in his jurisdiction to promote adoption of improved dry land technology among the farmers most quickly. Improved dry land technology demonstration should be conducted on the farmers' fields. This will also make the VEW confident about the improved dry land technology. Modification can be done on improved dry land technology on the basis of demonstration to suit local conditions. The VEW should select farmers from each category i.e. marginal, small and big farmers. Farming women may also be included. The farmers should be motivated to try out improved dry land technology in their fields, allow other farmers to visit their fields and spread the improved dry land technology among the farmers. The VEW should visit the demonstration farmer's field. He should make a visit schedule for the forth-coming month on the basis of the time of operation of agriculture operation and the demonstration farmer's convenience. He should educate them along with their farming members. He should visit the demonstration plots along with them to witness the performance of the improved dry land technology.
Field day: The field day should be conducted with a great festivity at the demonstration plot to spread the success of the improved dry land technology. Extension workers and mass media personnel should attend it. The farmers should watch the demonstration plot and then attend a meeting inaugurated by a dignitary. The demonstration farmers should explain about improved dry land technology done in the field to the farmers after which it will be the VEW's turn to speak. The farmers should be encouraged to raise questions. Leaflet should be distributed to give more impact of the field day. The VEW should prepare leaflets out of his field experience. Similarly, visual aids, poster, charts, flash cards should be made on the improved dry land technology by local artists as well as by the villagers under the guidance of the VEW. The visual aids made by the villagers may not be attractive as mass products, but they would reflect their involvement and interest in the program.

There are several extension-teaching aids. Each has its advantages and limitations. Appropriate methods should be selected according to cost, time and the availability for the farmers. Funds should be budgeted for providing teaching aids to the VEW.

Training: Training farmers about the improved dry land technology should be an integral part of the education program. The number of training courses and topics should be on the basis of the farmers' needs. Training should take place at the demonstration plots. It should involve ten to twenty farmers at most to impart knowledge and limited number, perhaps even a single farmer for skill development. The VEW should do the training. When the farmer becomes confident about the improved dry land technology, he should take over the training. In the training session, the farmers should be intensively trained. They learn better, faster and easier through seeing and doing. Accordingly, the VEW should show the sample of seed in the training session. It would be even better to show it in the field and discuss it's characteristics and cultivation practices. To develop skill, the farmers should do the
operation. Besides the formal training, the VEW should impart training informally to the farmers when he meets them in the village. There should not be a long gap between the teaching of a technology and its implementation.

**Success story:** The VEW should keep a diary to write down the activities performed in the fields and the farmers' response. He should write success stories on the basis of his notes for publication in newspaper and journals. The electronic media should invite the VEW to broadcast/telecast his experience of the improved dry land technology.

**Evaluation:** The VEW should evaluate the effectiveness of each and every activity of the field program. The methodology will be simple and practical based on first-hand information of the field collected through observation. The farmers can be asked if they know the improved dry land technology and are adopting them. If large area is under the improved dry land technology, the program is doing well. If they do not, there is a problem in implementation. The VEW must study to find out the solution to the problem to strengthen the program.

**Facility:** The VEW is a grass root worker. The Government should provide facilities for mobility, promotion and children's education. Financial rewards should be given to the outstanding VEW.

**Mass Media**

**Radio:** Majority of the farmers had radio in the village. They listen to the agriculture programme, which has become popular and benefited them. They desired that the agriculture program should be in Marwari (a Local Language), which will enable the uneducated farmers to understand the program easily. The improved varieties are in English therefore they cannot pronounce it and hence cannot remember. It should be repeated again and again during the entertainment
programme. The unit of measurement should be in local unit. The progressive farmers of the area should be invited to present their experiences and method of doing the improved dry land technology.

The personnel responsible for the programme of the radio should go and stay a few days in a few of the villages to know how the farmers do the agriculture operations, what is their problem in agriculture and what functional and situational problems are there in adoption of the agriculture information broadcast by the radio. This will enable him in designing of relevant programme for the farmers.

**Television:** Television was available to only about one-fourth of the farmers in the village, as most of the villagers will not able to afford it due to high cost. The price of it should be lowered down so that the villagers can purchase it. It was found not successful to generate a desire impact among the owner of the television about improved dry land technology. The sole reason was that the programme is telecasted from the capital of the state. This area is different with other part of the state. The drought often occurs and the soil is sandy. It is necessary to allot adequate time of this area and relevant information from the research station should be collected to telecast for the benefit of the area.

**Newspaper:** A few farmers read the newspapers. It did not help the farmers about dry land agriculture since there was hardly coverage about the agriculture as was found with the discussion of the farmers. They wanted that the newspaper should cover about the agriculture in great detail. The newspaper should give about package of dry land crops before onset of monsoon, the availability of the inputs and its cost. During the crop season, it should give information about the crop according to its stage. It should cover about field problems of the agriculture like spread of insect and disease. The newspaper personal should have close link with the research institute and the agriculture department.
**Input Management**

**Improved Seeds:** It was found that the farmers felt cost of improved seed high. It is therefore essential that the farmers should be educated about growing of improved seed. The cost on transport will be reduced and the seed will be cheap. It will also ensure availability of seed in time which is very important for the dry land area. The field extension worker should select a few progressive farmers and should educate them about growing of the improved seed at their field. The field extension workers should also take guidance and support from the research scientists located near to their area. As the seed technology involves several steps, they should be in close contact with the selected farmers.

ICAR research institute should also produce improved seed for sale of the farmers.

There were deficiencies in the seed distribution system. Among these were complaints regarding very poor germination, seed bearing fake quality certification and seeds of mixed/impure variety. These are of serious concern. Farmers in arid zone are basically short of finance; in buying improved seed they invest their scarce resources, in the hope of reaping better return in the form of higher yield. If the seed turns out to be a failure, the farmer loses both his immediate investment, and also his hope of a potential higher yield/income from the harvest. The farmer’s loss also reflects in the loss of credibility of the extension agency and the agriculture department.

At a deeper level, the loss of credibility in one respect may get generalized into others also. Thus the farmers who suffer loss having trusted the extension/input supply agency in seeds may also lose trust regarding other developmental advices as well. As is known, negative news travels faster & wider. It is therefore necessary for the developmental administration to take such steps as may be needed to
rectify the system and achieve total credibility in the eyes of the farmers.

Some farmers also indicated that the 'improved food' of certain crops do not possess some of the desired qualities. This has implications again for scientific establishment in terms of modifying the agenda. If farmers' desires are not considered or included in the researchers' breeding plans, there is something wrong and the system needs to be changed.

Chemical fertilizer: The farmers also reported high cost of chemical technology. This problem can be minimized if the farmers are educated about composting of cow dung. In India most of the farmers keep animals and in the study area it was found that most of farmers had animals. Thus the cow dung is available and they apply to the fields. However it is not so beneficial for the crops as it is not well decomposed. It is kept open as heap. When it is applied to the field, it also become a source of termites. The farmers should be educated about composting the cow dung, animal left over fodder and kitchen material. They can reduce quantity of the chemical fertilizers. Besides, the compost will maintain fertility of soil which is vital for agriculture production.

The farmers should educated about rhizobium culture which is low in cost.

The farmers should be educated about soil testing. It was found in the area that soil testing was not done. More laboratories should be established in the area so that the farmers should avail facility.

Plant protection: The farmers should be educated method of plant protection and seed treatment. Although subsidy on plant protection equipment for small and marginal farmers exist, they are not able to avail the facility due to lack of knowledge. They should be made aware of the provision of the facility.
**Input Dealers:** Private input dealers are the source of seeds, fertilizer and pesticide. They do not have adequate knowledge about agriculture and importance of quality of inputs. Short term training programme should be given to them by the research institutions about agriculture. It is also worthwhile that license should be given to unemployed agriculture graduate who can contribute in wide adoption of the improved dry land technology.

**Suggestions for future research:** Present study deals with factors related to farmers for adoption of improved dry land technology. Adoption is governed by several factors like characteristics of the technology, village environment, extension system, government policy and output management to name a few. There is need for research to cover several aspects influencing the adoption.

The independent variables predicted only 36 percent prediction in the adoption of the improved dry land technology. It is therefore important to select more variables and measurement of variables should also be refined.

The study covers dry farming practices of arid area. It is necessary to take other agro-climatic area for future study.

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