

AWARENESS AND ADOPTION OF RECOMMENDED LAND REHABILITATION TECHNIQUES BY THE FARMERS OF SALT AFFECTED LANDS

By

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SUMMARY

A lot of work regarding salinity management and rehabilitation of salt affected lands has been taken up at government level, but the evaluation of the adoption level of the farmers and the problems of the farming communities who are suffering from soil salinity has never been monitored. This situation demands a comprehensive study into the matter i.e., the extent of which the recommended land rehabilitation practices for salt affected land has been adopted by the farmers of salt affected lands. The present study was designed to inquire the status of the adoption of the soil rehabilitation measures and the problems faced by the farmers. This will facilitate the researchers and planners for further investigation, planning and facilitation to the farmers for rehabilitation of their salt affected lands. The study was conducted on salt affected areas of tehsil Sahiwal district Sargodha. The major problem in tehsil Sahiwal is waterlogging and salinity. Twenty two villages of tehsil Sahiwal are the badly salt affected villages. Out of these twenty two villages, 11 (fifty percent) were selected randomly for the study. Further 12 respondents from each village were selected through random sampling technique. So the sample size was 132 respondents. The data were collected through personal interviews from the farmers possessing the salt affected lands. The respondents were asked questions relevant to the objectives of the research study with the help of interview schedule. The data were then tabulated and analysed to draw the conclusions and make the suggestions. An overwhelming majority (94.7%) of the respondents were aware of the different techniques of land rehabilitation. Majority of the respondents among those who were aware (56.6%) had adopted the techniques of soil scraping followed by 53.8% of the respondents who reported the adoption of leaching. Among the chemical methods of land rehabilitation, majority of the respondents (89.6%) opted the method of application of gypsum. Among the other chemical methods, about 38.7% of the respondents reported the use of H_2SO_4 as a method of soil reclamation. A very small percentage of the respondents (8.5%) reported the use of sulphuric acid and HCl (2.8%) as a soil rehabilitation technique. The farmers mostly preferred the biological methods of soil reclamation as compared to physical and chemical methods of land rehabilitation. Majority of the respondents who adopted the biological technologies like growing of salt tolerant trees, growing of salt tolerant grasses/bushes were 94.3% and 93.4% respectively. The respondents who adopted the biological technologies like green manuring, adding farmyard manure and adding pressmud were 32%, 75.5% and 47.2% respectively. Only 12% of the respondents opted fish farming as the non conventional use of their saline lands. A large majority (98.5%) of the respondents reported high labour charges as the main difficulty for rehabilitation of their saline lands. Majority of the respondents, (97.7%) reported shortage of irrigation water as the main problem for not rehabilitating their saline lands. Another 95.5% of the respondents reported that non-cooperation of agencies or sources which provide guidance is the main difficulty in adoption of recommended technologies. Lack of credit facilities was the main problem reported by 94.7% of the respondents.

Key Words: Awareness, Adoption, Land Rehabilitation, Salt Affected Lands.

INTRODUCTION

Pakistan is an agricultural country and its economy depends mainly on this sector. Agriculture provides more than 90 percent of the food requirement of the people of Pakistan. It accounts for 25 percent of the GDP and provides employment to more than 50 percent of the population.

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Furthermore, about 80 percent of agricultural production comes from the irrigated agriculture and only 20 percent is contributed by the rain-fed agriculture (Pakistan Economic Survey, 2009). Being a major contributor to the economic sector, the growth and prosperity of economy has a gross reliance on irrigated agriculture.

Ever increasing population of the country demands proportionate increase in food production commensurate to the growing needs of populace. But soil salinity is one of the serious problems affecting the crop productivity and environment in the country. Over the last three decades, the primary agricultural regions have undergone severe losses in agricultural productivity due to soil salinity. Since Pakistan has generally plain topography with limited natural drainage, the problem of waterlogging and salinity became the worst in the middle of 20th century (WAPDA, 2005). About 21 percent of the total area of Indus Basin is affected due to salinity/sodicity. Out of which 10 percent is slightly saline, 4 percent moderately saline and 7 percent is strongly saline (WAPDA, 2005a). Furthermore, it is estimated that 62 percent loss in agricultural incomes is directly associated with salts. Nevertheless, the full socio-economic impacts associated with salinity in Pakistan have yet to be fully evaluated, particularly the full range of responses devised by farmers and farm families to cope with this growing problem.

No significant work regarding evaluation of the adoption of land rehabilitation measures by salt land users has been done in Pakistan and especially in Tehsil Sahiwal of District Sargodha. The present study is first of its kind. This situation demands comprehensive study into the matter; i.e. the extent of which the recommended practices for rehabilitation of salt affected land has been adopted by the salt land users. The present study was designed to inquire the status of the adoption of the soil rehabilitation measures adopted and the problems faced by the farmers. This will facilitate the researchers and planners for further investigation, planning and facilitation to the farmers for rehabilitation of the salt affected lands.

There are three types of salt affected soils i.e. saline, saline sodic and sodic soils and each type of salt affected soils needs a different approach for soil rehabilitation. A comprehensive approach should be adopted wherein all chemical, physical, biological and some non-conventional interventions be opted for rehabilitation of salt affected lands. Physical methods include leaching, soil scraping, deep ploughing, sanding and horizon mixing. Chemical methods include application of chemicals such as gypsum, sulphur, sulphuric acid and hydrochloric acid whereas biological methods include growing of salt tolerant crops, trees, grasses and bushes and/or their incorporation at the stage of maximum biomass production. The addition of large amounts of organic matter in the shape of farmyard manure or press mud etc. is also a common practice. Some non-conventional interventions for the use of saline lands include their use for fish farming or using as pastures for raising of livestock. The main objective of this study was to evaluate the awareness and adoption level of farmers for opting the different recommended saline agriculture technologies like amelioration of soil through various physical and chemical methods, growing of salt tolerant crops, trees, grasses/bushes and developing pastures and fish ponds in tehsil Sahiwal, district Sargodha.

MATERIALS AND METHODS

In order to obtain valid and reliable data pertaining to the problem under investigation, the researcher needed to take into consideration a number of important factors like appropriate area, identification of research population, selection of study respondents/sampling techniques and appropriate choice of statistical methods for data analysis. Keeping in view all of these parameters, tehsil Sahiwal of district Sargodha was selected as a universe of this study because major problem in tehsil Sahiwal is waterlogging and salinity. It is the most salt affected tehsil of Sargodha. The study was limited to the saline areas of tehsil Sahiwal. Tehsil Sahiwal consists of 14 Union Councils and 144 villages. Out of 144 villages of tehsil Sahiwal, 22 villages are the worst salt affected villages. These 22 villages have a gross area of 51488 acres and cultivable area of 37482 acres 72.8% of GA (Gross area). Out of the cultivable area about 9937 acres (26.5%) are salt affected and abandoned lands (Haq *et al.*, 2000).

Out of the 22 severely salt affected villages, 11 (fifty percent) were selected randomly for the study. Further total of 132 respondents were selected by including equal number of respondents i.e. 12 from each village through random sampling technique. In order to collect the needed information, a well equipped interview schedule keeping in view the objectives of the study was designed. The data collected were tabulated systematically and analyzed statistically.

RESULTS AND DISCUSSION

1. Socio-Economic Characteristics of the Respondents

The personal information (Socio- Economic Characteristics) about the respondents indicated that majority (62.1%) of the respondents were owner cultivators and most of the respondents (30.3%) owned 12.1 - 25 acres of land and about 4807 acres (88.8%) of the total land holdings were affected due to salinity sodicity. Out of total respondents 64.4% were literate and among those literate farmers, 87.0% were educated upto Matric. Similarly, the half (50%) of the respondents were of age group 41-60 years.

2. Awareness of Respondents Regarding Recommended Land Rehabilitation Techniques

Data presented in Figure-1 indicate that an overwhelming majority (94.7%) of the respondents were aware of the different techniques of land rehabilitation. There are many methods of land rehabilitation like physical, chemical and biological. The respondents, aware of any one method of land rehabilitation, claimed they were fully aware of land rehabilitation techniques. That's the reason; the respondents who answered that they were totally ignorant of the land rehabilitation techniques were only 5.3%. These results are in agreement with those found of Mirani *et al.* (2002) and Shah *et al.* (2004), who found that 84.5% and 92% respondents respectively were fully aware of land rehabilitation techniques.

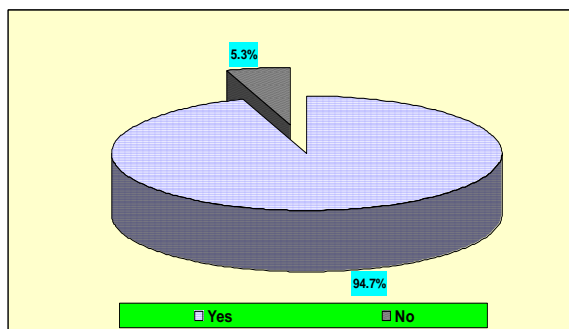


Figure-1 Distribution of the respondents according to awareness level of land rehabilitation methods

The respondents were further asked relevant questions to obtain their responses regarding awareness about different methods of land rehabilitation. The responses thus obtained are given in Figures 2 to 4.

There were three main methods of land rehabilitation i.e., physical, chemical and biological. The awareness response about different methods under each category is discussed as under.

Physical Methods: The data reflected in Figure 2 reveal that majority of the respondents (79.8%) were aware of method of soil scraping followed by 71% who were aware of leaching. The respondents aware of the method of deep ploughing were 40.3%. Majority of the respondents (80.6%) were totally unaware of the sanding method of land rehabilitation.

Chemical Methods: The data given in Figure-3 reveal that under the chemical methods of land rehabilitation, majority of the respondents (97.6%) were aware of the application of gypsum. One fourth (25%) of the respondents were aware of application of sulphur as a soil reclamant.

The respondents aware of the application of sulphuric acid technique were 58.9%. Majority of the respondents (95.2%) were totally unaware of the application of HCl as a method of soil rehabilitation.

Biological Methods: The data shown in Figure-4 indicate that all the respondents (100%) were aware of growing salt tolerant trees. While 96% of the respondents reported that they are aware of growing of salt tolerant grasses / bushes. Among the biological methods of soil rehabilitation about half of the respondents i.e. 51.6% reported that they were aware of the methods of green manuring. About 89.5% of the respondents reported that they were aware of the technology of adding farmyard manure as method of land rehabilitation. The respondents who were fully aware of the method of adding pressmud to reclaim their salt affected lands were 69.4%.

These results are in agreement to Shah *et al.* (2000) and Shah *et al.* (2004), while in partial agreement to Ijaz and Davidson (1997).

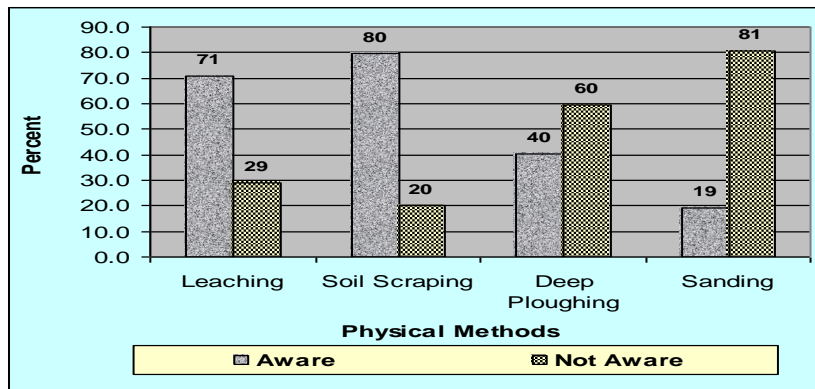


Figure 2. Awareness of recommended techniques (physical methods)

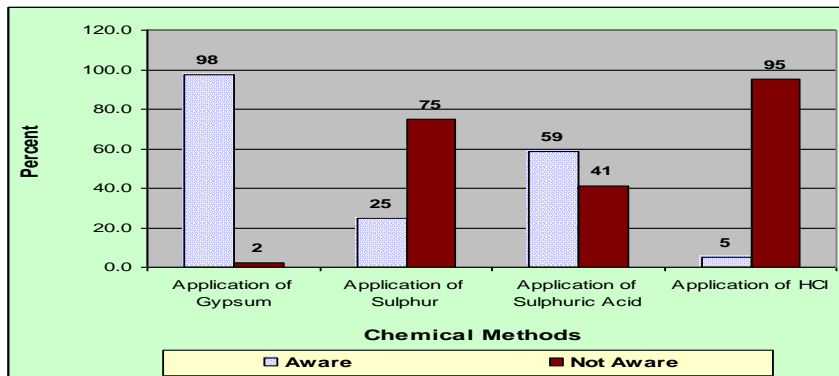


Figure 3 Awareness of recommended techniques (chemical methods)

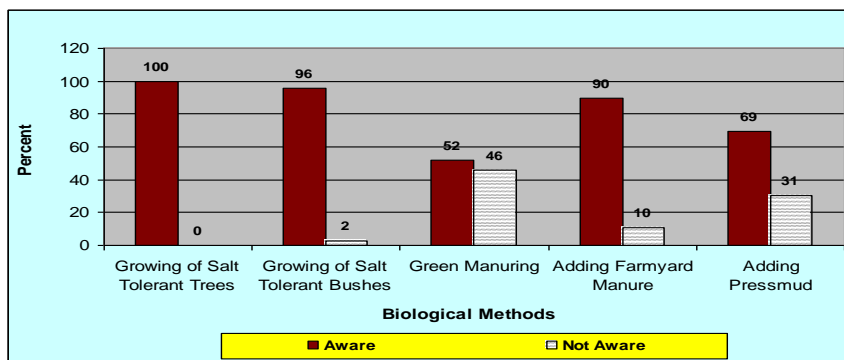


Figure 4 Awareness of recommended techniques (biological methods)

3 Awareness of the Respondents Regarding Non-Traditional Use of Saline Lands

Non-traditional use of the highly salt-affected soils, difficult to reclaim and restore its original productivity level can be used for pastures or fish farming. The selected farmers were also asked about their awareness regarding non-traditional uses of saline lands. Majority of the respondents (95.5%) were aware of the non-traditional uses of such type of lands as shown in Figure-5.

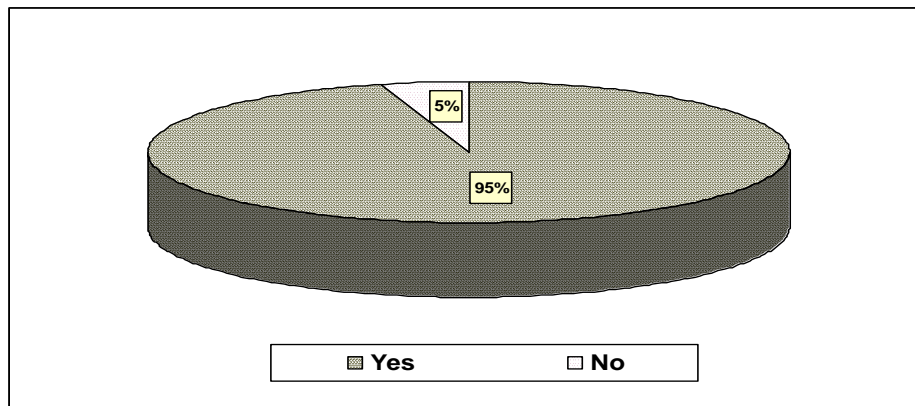


Figure-5 Awareness of non-traditional use of saline lands

Awareness level of different methods of non traditional uses of saline lands is shown in Figure 6. A clear majority of the respondents 98.4% were having the knowledge for use of saline lands for fish farming. In case of awareness about the use of saline lands as pastures about 57.1% of respondents reported total unawareness about this technique for the use of saline lands. These results are completely in accordance to Shah *et al.* (2004) who found that majority of the respondents were aware of the method of fish farming for the use of saline lands in Pindi Bhattian area.

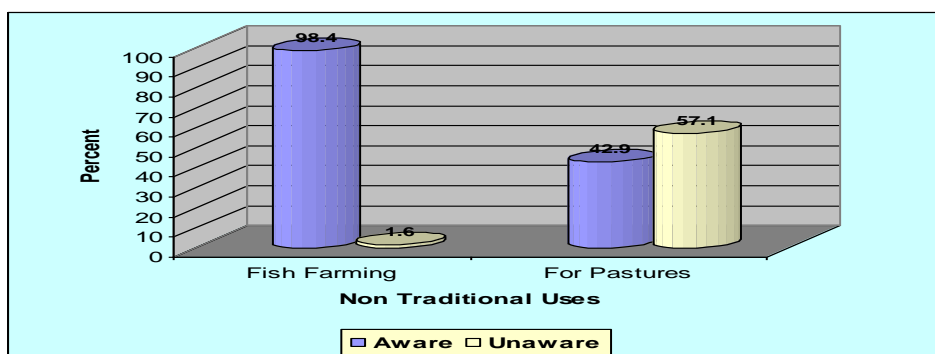


Figure 6 Awareness of non-traditional techniques for use of saline land

4 Adoption of Respondents Regarding Recommended Land Rehabilitation Techniques

Numbers of steps are involved in the adoption process. It is the process of awareness, interest, evaluation, trial and final adoption of an innovation. Adoption of a new practice or innovation depends upon the awareness of its merits among the farming community. Same is applicable with the case of recommended land rehabilitation techniques to make the unproductive lands as productive. The data regarding the adoption of recommended land rehabilitation practices by the respondents is shown in Figures-7.

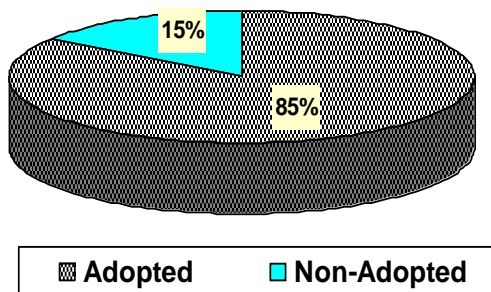


Figure-7 Adoption of recommended land rehabilitation techniques.

It is evident from data that 84.8% of respondents who were aware had adopted the recommended land rehabilitation practices, while only 15.2% of respondents were those, who were aware of techniques but did not adopt any of them. These results are in agreement with those found by Ijaz and Davidson (1997), Amjad (2002) and Shah *et al.* (2004).

The respondents were asked about the adoption of different methods on land rehabilitation. The responses thus obtained are given in Table-1. Data indicate that majority of the respondents among those aware (56.6%) had adopted the techniques of soil scraping followed by 53.8% of the respondents who reported the adoption of leaching. About 19.8% of the respondents adopted the technique of deep ploughing for rehabilitation of their saline lands. Majority of the wary respondents (96%) had not opted the technique of sanding. Among the chemical methods of land rehabilitation, majority of the respondents (89.6%) opted the method of application of gypsum. Among the other chemical methods, about 38.7% of the respondents reported the use of H₂SO₄ as a method of soil reclamation. A very small percentage of the respondents (8.5%) reported the use of sulphuric acid and HCl (2.8%) as a soil rehabilitation technique.

It is evident from data that the farmers mostly preferred the biological methods of soil reclamation as compared to physical and chemical methods of land rehabilitation. Majority of the respondents who adopted the biological technologies like growing of salt tolerant trees, growing of salt tolerant grasses/bushes were 94.3% and 93.4% respectively. The respondents who adopted the biological technologies like green manuring, adding farmyard manure and adding pressmud were 32%, 75.5% and 47.2% respectively. These results are in agreement of those reported by Ijaz and Davidson (1997), Shah *et al.* (2000) and Shah *et al.* (2004).

5 Adoption of Respondents Regarding Non Traditional Uses of Saline Lands

It is clearly evident from data given in Table-2 that 46.2% of the respondents adopted fish farming for the use of their saline lands. Majority of the respondent (76.4%) have not used their saline lands for pastures. Only 23.6% of respondents adopted this technique for rehabilitation of their saline lands. These results are in full agreement to Shah *et al.* (2000) and Subhani *et al.* (2007) and disagreement to Ijaz and Davidson (1997).

Table 1 Adoption of recommended land rehabilitation techniques

(Valid No. = 106)

Land Rehabilitation Techniques		Adoption of Recommended Land Rehabilitation Techniques			
		Adopted		Not Adopted	
		No. of Respondents	%age	No. of Respondents	%age
(a) Physical Methods	Leaching	57	53.8	49	46.2
	Soil Scraping	60	56.6	46	43.4
	Deep Ploughing	21	19.8	85	80.2
	Sanding	4	3.8	100	96.2

(b) Chemical Methods	Application of Gypsum	95	89.6	10	9.4
	Application of Sulphur	9	8.5	97	91.5
	Application of H ₂ SO ₄	41	38.7	65	61.3
	Application of HCl	3	2.8	103	97.2
(c) Biological Methods	Growing of Salt Tolerant Trees	100	94.3	6	5.7
	Growing of Salt Tolerant Bushes	99	93.4	7	6.6
	Green Manuring	34	32.0	72	68.0
	Adding Farmyard Manure	80	75.5	26	24.5
	Adding Pressmud	50	47.2	56	52.8

Table -2 Adoption of non-traditional use of saline land

(Valid No.106)

Methods for Non-conventional use	Adoption of Recommended Techniques			
	Adopted		Not Adopted	
	No. of Respondents	%age	No. of Respondents	%age
Fish Farming	49	46.2	57	53.8
For Pastures	25	23.6	81	76.4

6 Difficulties Faced by the Farmers in Adoption of Land Rehabilitation Techniques

Implementation of any technology/method may involve certain complications, which sometimes restrict the adoption process. These complications are considered as hurdles or difficulties. The identification of these difficulties/hurdles may help the researchers to remove these hurdles. The respondents were, therefore, asked about their problems which became hurdles in rehabilitation of their saline lands. Their responses are given in Table-3.

The most important problem faced by the majority (98.5%) of the respondents was high labour charges. Most of techniques, particularly the physical methods involve the use of farm machinery and heavy labour, the cost of both is beyond the bearing capacity of the farmers. The other most important problems faced by majority of the respondents were the shortage of irrigation water to put more area under crop and non-cooperation of the agencies or sources which provide guidance, lack of credit facilities, non-availability of technical knowledge, non-availability of fertilizer, high prices of inputs/reclamants, lack of awareness, non-availability of technical knowledge and lack of financial resources as reported by respondents was 97.7%, 95.5%, 94.7%, 90.9%, 80.3%, 72.0% and 56.1% respectively. There were some other difficulties like un-availability of groundwater, lack of time and downward movement of water/leaching as reported by 54.5, 39.4 and 37.1% of the respondents respectively.

These findings are in agreement with those of Shah *et al.* (2000) and Shah *et al.* (2004) and in partial agreement of Ijaz and Davidson (1997).

TABLE- 3 Difficulties faced by the farmers in the adoption of land rehabilitation techniques

(Valid No.132)

Sr. No.	Difficulties	No. of Respondents	Percentage
1.	Lack of awareness of technical knowledge	95	72.0
2.	Lack of time	52	39.4
3.	Lack of financial resources	74	56.1
4.	Lack of interest	48	36.4
5.	Non-availability of labour at the time of need	58	43.9
6.	Non-availability of machinery, chemical and biological inputs at proper time	74	56.1
7.	Most of the land rehabilitation measures are expensive to adopt	120	90.9
8.	High prices of inputs/reclamants	106	80.3
9.	Non-availability of technical knowledge/ guidance	120	90.9

10.	Non-cooperation of agencies or sources which provide guidance regarding adoption of recommended land rehabilitation measures	126	95.5
11.	Lack of credit facilities	125	94.7
12.	High labour charges	130	98.5
13.	Shortage of irrigation water to put more area under crop	129	97.7
14.	Un-availability of groundwater	72	54.5
15.	Downward movement of water/leaching	49	37.1

CONCLUSIONS

1. A large majority (94.7%) of the respondents were aware of recommended land rehabilitation methods.
2. Among physical methods of land rehabilitation 79.8%, 71.0%, 40.3% and 19.4% of the respondents were aware of soil scraping, methods of leaching, deep ploughing and sanding.
3. Among chemical methods of land rehabilitation 97.6%, 58.9%, 25.0% and 4.8% of the respondents were aware of the application of Gypsum, use of H₂SO₄, sulphur and HCl respectively.
4. About biological methods of land rehabilitation 100%, 96%, 51.6%, 89.5% and 69.4% were aware of growing of salt tolerant trees, salt tolerant grasses/bushes, use of green manuring, farmyard manure and pressmud respectively.
5. A large majority of the respondents (95.5%) were aware of the non-traditional uses of saline lands. Out of aware respondents 98.4% and 42.9% were fully aware of the use of saline lands for fish farming and pastures respectively.
6. Among respondents who were aware 84.8% had adopted recommended land rehabilitation techniques while 15.2% of the respondents had not adopted any of the rehabilitation technique.
7. The respondents who adopted the physical method of land rehabilitation like leaching, soil scraping, deep ploughing and sanding were 53.8%, 56.6%, 19.8% and 3.8% respectively.
8. Among the chemical methods of land rehabilitation 89.6%, 38.7%, 8.5% and 2.8% opted the method of application of gypsum, H₂SO₄, sulphur and HCl respectively.
9. In case of biological methods of land rehabilitation 94.3%, 93.4%, 32.0%, 75.5% and 47.2% reported adoption of growing of salt tolerant trees, salt tolerant grasses / bushes, green manuring, adding farmyard manure and adding pressmud respectively.
10. The non conventional use of saline lands was 46.2% and 23.6% by adopting fish farming and pastures development.
11. A big majority of the respondents i.e. 98.5%, 97.7%, 95.5% and 94.7% reported that high labour charges, shortage of irrigation water, non-cooperation of agencies and lack of credit facilities are the main problems for non-rehabilitation of their salt affected lands.

RECOMMENDATIONS

On the basis of study findings, the following recommendations are made for policy makers. It may prove useful for enhancing the adoption of recommended techniques of land rehabilitation by the farmers and will increase the area under production.

1. Saline agriculture and rehabilitation of saline lands should be encouraged in the country through expert's guidance.
2. Rehabilitation of saline lands should be made at government level through the participatory approach by providing reclamants and salt tolerant crop varieties/plants.

3. Irrigation supplies of the salt affected areas should be increased to rehabilitate the saline lands. Farm machinery, required for land rehabilitation, should be made available in these areas on low rental rates.
4. Credit facilities should be made available to the farmers for the purchase of soil reclamation, farm machinery etc.
5. The farmers having severely affected lands should be encouraged through financial support and guidance to adopt fish farming.
6. Different techniques of saline land rehabilitation may be disseminated through Electronic and Print media and short duration training course be arranged for the salt land users.
7. Agricultural exhibitions and demonstrations should be arranged through concerned departments to create awareness, interest and motivation among the farmers to adopt improved land rehabilitation techniques.

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