



Research Article

ROLE OF AGRICULTURAL EXTENSION SERVICES IN DRYLAND FARMING WITH SPECIAL REFERENCE TO NAGOUR AND SHEKHAVATI REGIONS OF RAJASTHAN

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Received: June 09, 2023; Revised: July 26, 2023; Accepted: July 28, 2023; Published: July 30, 2023

Abstract: Dryland farming regions pose numerous challenges to agricultural productivity due to water scarcity, erratic rainfall, and soil degradation. Hence, effective agricultural extension services play an important role in disseminating knowledge, empowering farmers, and promoting sustainable practices. Agricultural extension services act as intermediaries, bridging the gap between research institutions, technology developers, and farmers. This research article investigates the role of agricultural extension services in the dryland farming regions of Rajasthan, India, with the aim of understanding their impact on improving agricultural practices and enhancing farmers' livelihoods. It also aims to find out working of different types of extension services along with their strengths and weaknesses in Nagaur and Shekhawati regions of Rajasthan which comes under dry land farming. As the scope of agriculture extension is increasingly becoming wider, the findings of this study provide valuable insights into the strengths and weaknesses of the existing extension system, highlighting areas for improvement and innovation.

Keywords: Dry land Farming, Agricultural Extension Services, Agricultural Technology, Management Agency

Citation: Sangwan S. and Dua R. (2023) Role of Agricultural Extension Services in Dryland Farming with Special Reference to Nagaur and Shekhawati Regions of Rajasthan. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 15, Issue 7, pp.- 12496-12501.

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Academic Editor / Reviewer: Anirudha Chattopadhyay, Anshu Gangwar

Introduction

Modern agricultural extension has grown to what may be the largest institutional development effort the world has ever known [1]. Agricultural extension services provide farmers with knowledge, information, and technical assistance to improve agricultural productivity, crop yields, and farm management practices. With a view to achieve a high level of production, it is not enough to accelerate generation of scientific technologies but it is equally necessary to transfer the latest technology from the research system to the ultimate users [2]. Extension services enable farmers to make informed decisions, adopt improved technologies, and enhance their productivity and livelihoods [3]. Agricultural extension is the function of providing need and demand-based knowledge in agronomic techniques and skills to rural communities in a systematic, participatory way, with the target of enhancing their production, income, and quality of life. The extension is essentially education, and it aims to bring about positive behavioral changes among farmers [4]. Agricultural extension comprises of many targets such as the dissemination of valuable and practical information related to farming practices, including improved seeds, nutrition, implements, pesticides, improved cultural practices, and animal husbandry. The extension is a crucial pillar both for rural development and agricultural research and development [5]. Indian agriculture faces several challenges and agricultural extension services can and should contribute to addressing these challenges [6]. However, it is realized that 60 per cent of the farmers in India do not access any source of information for cutting edge agricultural technologies resulting in adoption gap [7]. National policy framework for agricultural extension (2000) states that extensive use of modern information technology will be promoted for communication between researchers, extension workers and their farmer clients to transfer technologies and information more cost effectively [8]. The recommendations of working group on agricultural extension for formulation of eleventh five-year plan (2007-12) focuses on extension reach to Small, Marginal, Women farmers and dry land areas [9]. Rajasthan is a leading producer of many food and cash crops and contribute 50 per cent to the national

seed spices production. Agriculture accounts for 26 per cent of the SDP and about 66 per cent population is engaged in the agriculture and allied activities [10]. The State possesses second largest livestock population in India. Hence, it opens up a great Vista Research. The present study focuses on Nagaur and Shekhawati regions of Rajasthan which comes under dry land farming. Agriculture and allied sectors continue to be their backbone.

Study Area

The study area is situated in the Shekhawati and Nagaur regions of Rajasthan. These areas are the part of Bangar region of Rajasthan. The total area of the region is 31388.44 sq km. There are three districts (Sikar, Jhunjhunu, and Nagaur), 23 tehsils, and 3558 villages. This region has an inland drainage system. The Shekhawati region has sandy desert and the Barkhan is main landform. The Nagaur is part of Hamada, which has stone relief; the Salt Lake is the main characteristic of this region like Sanbher, Didwana, Degana and Kuchaman. The natural climatic conditions of the region are very extreme and harsh. The temperature ranges from below zero Celsius in winter to more than 50°C in summer. The agricultural productivity in the region remains limited due to the unconducive environment, limited choice of crops and aberrant weather conditions. Livelihood of villagers depends mainly on livestock rearing along with some rainfed farming.

Objectives of the Study

The main objective of the present study is to find out the role of emerging dry land farming technology and its dissemination amongst the farmers.

Sources of Data

The primary data have been collected through a framed research questionnaire. Beside this field observation, discussion and interview method is used to get in-depth and more reliable information.

Material and methods

Villages have been selected by a stratified purposive sampling method with the help of four parameters such as Agriculture density of the village, distance from the urban centers, percentage of net irrigated area, percentage of agriculture labour to total population. Based on the above parameters, rank is given to each village. Two villages are selected (first and last ranked) from each parameter. There are two different regions of Nagaur and Shekhawati, so total of 16 villages are chosen (8 villages from each region). After the selection of villages next step was to select households in a village. Eight to ten per cent households have been chosen from each of the sample villages. They have been chosen based on purposive sampling. Every care has been taken to select household based on their socio-economic status cast. From each household either the senior member of the household or the one who make major decisions regarding day-to-day affair of especially in agricultural matters was selected.

After the fieldwork was complete, all the questionnaires were thoroughly scrutinized. It was a stupendous task to process the raw data. Data was arranged in ascending /descending order and tabulation was done to squeeze a large set of data for a comparative and comprehensive study. Simple statistical techniques such as working out simple Percentage, frequencies and scoring scheme were used. The study employs a mixed-methods approach, combining quantitative data collection through surveys and qualitative data collection through interviews and focus group discussions. The survey data is analyzed using statistical techniques to assess the farmers' awareness, access to, and utilization of agricultural extension services, while the qualitative data provides insights into the farmers' perceptions, challenges, and opportunities related to these services.

Result and Discussion

Farmer - Institution Interface

To spread the extension services and increase the research and capacity building in dry land areas government has shaped many institutional arrangements, which includes Agricultural Universities (AU), Krishi Vigyan Kendra (KVKs), Agricultural Development Offices (ADO), Central Arid Research Zone institute (CAZRI), Council for Advancement of People's Action and Rural Technology (CAPART), Agricultural Technology Management Agency (ATMA) [11]. These institutions operate many agricultural activities for agricultural development and capacity building of farmers. To know about the success and failure of these institutions or to know how much they have succeeded to achieve their goals, it is important to understand the perception of farmers toward these institutions. To know more about it, questions are being asked from the respondents of Nagaur and Shekhawati region regarding AU, CAZARI, ADO, KVK, and ATMA and received information which is presented in [Table-1].

Table-1 Status of Farmer- Institution Interface in Nagaur and Shekhawati Regions

Institutions	Aware (%)		Benefitted (%)	
	Shekhawati	Nagaur	Shekhawati	Nagaur
AU	100	98	52	41
CAZRI	100	97	39	33
ADO	81	70	43	30
KVK	82	60	39	21
ATMA	89	79	41	25

Awareness level regarding Agricultural University and CAZRI is 98 per cent and 97 per cent in Nagaur whereas in Shekhawati region all the respondents are aware of these institutions. The respondents who have been benefitted from these two institutes are 41 and 33 per cent in Nagaur region and 52 and 39 per cent in Shekhawati region respectively. At the level of awareness, the difference is minute, but on the component of benefitted individuals' difference is more and this is because of the different levels of education.

On the Village level agricultural groups, there is much diversity of the levels of awareness and benefitted respondents. Such respondents are more than 90 per cent in highly irrigated villages like Rolchanawata in Nagaur region and Jagdishpura in Shekhawati. Large farmers are more aware whereas more than 40 per cent benefitted respondents are small farmers. This may be due to that the government prioritize backward and marginalized farmers.

Agricultural development offices are established at the district level. Their primary

function is to work as a link between agriculture department and farmers. During the field survey, researcher experienced that Agricultural development offices that are supposed to be facilitation centers, merely working as a data gathering agency. Seventy per cent respondents from Nagaur and eighty per cent from Shekhawati region are aware of Agricultural development offices, whereas benefitted respondents are 30 and 43 per cent respectively. Maximum benefitted respondents in Nagaur region are 70 per cent in the Saranwas village, whereas 85 per cent respondents from the Kishorpura village from Shekhawati region have been benefitted from the agriculture development offices. Minimum beneficiaries are in Raisingpura (Nagaur) and Naya Bas (Shekhawati).

Agricultural Technology Management Agency (ATMA) at the district level would be increasingly responsible for all the technology dissemination activities at the districts. The project was initiated by Ministry of Agriculture, Government of India with the financial assistance of World Bank. The ATMA scheme in Rajasthan was implemented in October 2005 [12]. District level ATMA are established for both the regions. Respondents who are aware about ATMA forms 89 per cent and 79 per cent in Shekhawati and Nagaur regions respectively. All the respondents from the village of Saranwas, Raisingpura of Nagaur region and Jagdishpura, Kishorpura and BangothriKalanof Shekhawati region are aware of Agricultural technology management agencies.

However, the level of beneficiaries by ATMA is very dissatisfactory for both the regions. Only 41 and 25 per cent respondents from Shekhawati and Nagaur regions respectively got benefitted from the activities of ATMA. Only one per cent respondents in Raisingpura (Nagaur) got the benefit from ATMA, that is tiny. Whereas, in Shekhawati region almost every village having more than 10 per cent respondents got benefitted from ATMA. The researcher experienced during the field survey that the activities of ATMA are either centralized in the nearest village of district headquarter or hampered by political interferences.

Krishi Vigyan Kendra (KVK) is an institutional project of the Indian Council of agricultural research (ICAR). It demonstrates the application of science and technology on the farmer's field and in the rural areas with the help of a multidisciplinary team of scientists. One KVK is established in every district of the region, in this way one KVK is working in the Nagaur region, and two KVKs are working in the Shekhawati region. Eighty-two per cent respondents of Sekhawati and 60 per cent of Nagaur region are aware of KVK activities. However, the level of beneficiaries of KVKs is not very satisfactory in both the regions. Only 39 per cent and 21 per cent respondents from Shekhawati and Nagaur regions respectively got benefitted from KVKs. All these numbers are quite dissatisfactory and indicate the limitations of the extension services prevailed in both the regions. There is relative variation at village level in terms of awareness and benefitted respondents. Maximum numbers of respondents who been benefitted are in Saranwas and Rolchandawata of Nagaur region and Jagdishpura and Kishorpura of Shekhawati region.

Levels of Dry Land Farming Technology Dissemination

After independence, many plans, and institutional arrangements came up with the development and advancement of agriculture. The government has given very less attention to the promotion of dry land agriculture compared to irrigated area agriculture development, but still there are some real efforts for advancement and dissemination of traditional and modern dry land farming. To induce the development of dry land farming, CAZRI and Central Research Institute for Dryland Agriculture (CRIDA) was established. Modern agriculture practices and input techniques developed by these institutions were diffused by using the platform of ATMA and KVK, and helped to reach it to the beneficiaries.

It is clear from the findings presented in [Table-2,3] that dissemination of dry land farming technology in Nagaur and Shekhawati through these institutions have not completely achieved their desired objectives. Advice, training, technical help, financial help, the adoption and success rate of various dry land farming techniques like zero tillage, raised bed, mulching, strip cropping, crop rotation, contour cultivation, stabilizing bunds, afforestation and bunding are also being discussed. There is a wide difference in advice, adoption and success rates for different technologies. Regarding advice, Nagaur has higher levels of crop rotation and afforestation whereas it is least in contour cultivation.

Table-2 Level of Dry Land Farming Technology Dissemination in Nagaur Region

Extension Message	Advice	Training	Technical Help	Financial Help	Adopted	Successful
Zero Tillage	57	2	4	5	39	27
Raised Beds	49	--	3	2	19	11
Mulching	41	3	3	1	29	17
Strip Cropping	39	--	--	--	11	4
Crop Rotation	90	--	2	9	80	71
Contour Cultivation	27	--	3	2	10	3
Stabilizing Bunds	29	--	1	3	19	9
Afforestation	90	4	9	21	68	32
Bunding	59	1	2	5	38	22

Table-3 Level of Dry Land Farming Technology Dissemination in Shekhawati Region

Extension Message	Advice	Training	Technical Help	Financial Help	Adopted	Successful
Zero Tillage	60	3	4	7	40	29
Raised Beds	54	1	4	3	23	13
Mulching	44	3	5	2	24	16
Strip Cropping	40	--	--	--	17	7
Crop Rotation	95	--	3	16	90	82
Contour Cultivation	35	1	--	3	11	4
Stabilizing Bunds	39	--	2	3	23	9
Afforestation	96	7	14	33	73	37
Bunding	67	2	5	7	45	37

Table-4 Level of Crop Extension Message Dissemination in Nagaur Region

Extension Message	Advice	Training	Technical Help	Financial Help	Adopted	Successful
Spacing	45	3	2	1	21	11
Use of Agrochemicals	59	5	1	20	34	19
Erosion control	69	21	17	23	49	23
Use of Organic Fertilizers	44	3	5	2	15	13
Use of Improved Seed	75	5	2	34	55	34
Mechanization	80	5	3	9	71	62
Irrigation Technology	46	3	6	11	25	21
Crop Storage	59	--	2	3	38	19
Cleaning	79	--	2	3	63	54
Sorting	55	2	3	1	33	17
Grading	43	2	3	3	15	7
Packing	32	--	--	1	10	4
Agro-processing	23	--	2	2	8	3
Agroforestry	49	2	3	8	12	5
Water Conservation	78	4	44	51	78	67
Diversification	39	1	--	5	11	4

Table-5 Level of Crop Extension Message Dissemination in Shekhawati Region

Extension Message	Advice	Training	Technical Help	Financial Help	Adopted	Successful
Spacing	54	4	3	1	25	13
Use of Agrochemicals	67	5	1	23	45	17
Erosion control	76	27	16	29	55	31
Use of Organic Fertilizers	53	6	5	4	19	14
Use of Improved Seed	89	5	2	42	65	41
Mechanization	92	5	3	12	89	81
Irrigation Technology	59	3	6	17	32	24
Crop Storage	79	--	2	3	43	21
Cleaning	87	--	2	3	65	59
Sorting	51	2	3	1	35	18
Grading	47	2	3	3	16	9
Packing	41	--	--	1	15	6
Agro-processing	25	--	2	2	12	4
Agroforestry	51	2	3	8	15	7
Water Conservation	84	4	44	49	79	60
Diversification	40	1	--	5	15	7

Table-6 Level of Livestock Extension Message Dissemination in Nagaur Region

Extension Message	Advice	Training	Technical Help	Financial Help	Adopted	Successful
Feed & Proper Feeding	65	-	7	3	54	39
Housing	49	-	3	4	39	35
Proper Milking	69	3	-	-	41	29
Milk Hygiene	92	2	4	5	85	81
Disease Control	55	2	1	1	43	29
Pasture Establishment	65	--	2	10	38	26
Storage	76	3	2	4	36	21
Processing	21	1	3	7	6	2
Marketing	42	1	3	3	31	21

Table-7 Level of Livestock Extension Message Dissemination in Shekhawati Region

Extension Message	Advice	Training	Technical Help	Financial Help	Adopted	Successful
Feed & Proper Feeding	71	2	4	5	61	43
Housing	55	-	3	6	41	39
Proper Milking	74	5	3	-	53	42
Milk Hygiene	98	-	5	3	90	89
Disease Control	65	4	2	3	56	34
Pasture Establishment	64	2	3	4	35	27
Storage	81	5	1	4	39	29
Processing	32	1	9	7	9	3
Marketing	44	2	4	5	33	24

Not much difference is there at the village level. The only difference is that highly irrigated areas are having high numbers of respondents seeking advice like in the Ralchandawata village in Nagaur region and Jagdishpura village in Shekhawati region.

Training related procedure of extension services is feeble. None of the processes has more than 10 per cent respondents. In some villages, not a single respondent is trained. These are the villages of Raisinghpura, Bhairupura in Nagaur region and Jhajjar and Doongarawas in Shekhawati region. In regards to obtaining technical help for extension message, the maximum percentage of respondents is for afforestation. Maximum financial assistance is for afforestation too. In Nagaur region, 21 per cent and Shekhawati 33 per cent respondents receives funding for afforestation. Thus, it is clearly revealed that the level of training, technical and financial help is not satisfactory for the matters of extension messages. Which further hampers the adoption and success of extension messages to farmers.

The most successful extension message is crop rotation. In Nagaur region 71 per cent and 82 per cent in Shekhawati region deemed it successful. Almost all the villages have more than 60 per cent respondents, which considered it successful. More than 50 per cent respondents considered afforestation related extension messages are successful. Shekhawati region is more successful in the process of extension messages as comparable to Nagaur region. The main reasons behind that there is a high level of agriculture development in Shekhawati region, proximity from urban centers, and innovative nature of farmers.

Levels of Crop Extension Message Dissemination

The dissemination of extension messages for different crops is a very crucial aspect in the dry land farming areas. Respondents were asked about the dissemination extension messages for different crops in Nagaur and Shekhawati regions. The results are presented in the [Table-4,5].

In the matters of advice to extension messages, activities related to erosion control are incorporated. In Nagaur region 69 per cent, and Shekhawati region 76 per cent respondents obtain advice related to crop extension. Moreover, to adopt these measures, 49 per cent respondents in Nagaur and 55 per cent in Shekhawati regions responded positively. Mechanization is increasing in the agricultural activities. In Nagaur region, 80 per cent, and Shekhawati region, 92 per cent respondents obtain advice related to mechanization. Whereas 71 per cent and 89 per cent of the respondents for Nagaur and Shekhawati regions respectively adopt these measures, and 62 and 81 per cent considered it successful for Nagaur and Shekhawati regions respectively.

Highly irrigated villages like Rolchandawata and Jagdishpura, and the villages like Bhariupura and Bangothrikalan, which are lacking in agricultural labor have a high Percentage of mechanization as high as 60 per cent. The main means of mechanization is a tractor. Large farmers own their tractors whereas small and marginal farmers hire Tractor services. In Nagaur region, 59 per cent and Shekhawati region, 67 per cent respondents obtain advice related to agro-chemicals extension messages, whereas 34 per cent and 45 per cent of the respondents adopted it in Nagaur and Shekhawati regions respectively. Percentage of respondents for Nagaur and Shekhawati regions who consider these measures of advice related to agrochemicals successful is 19 and 17 respectively. Agro-chemicals are mainly used in irrigated regions and areas of vegetable production, but comparatively this is not a matter of profit. The villages, which use maximum and minimum agro-chemicals in Nagaur are Rolchandawata and Raisinghpura in Nagaur region and Jagdishpura and Jhajjar in Shekhawati

region. Traditionally, both the regions having tendency of using organic fertilizers. In Nagaur region 44 per cent and Shekhawati region, 53 per cent respondents obtain advice regarding organic fertilizers. But adoption of this advice is not satisfactory, as 15 per cent of the total respondents in Nagaur region and 19 per cent in Shekhawati region adopted these methods, whereas 13 per cent in Nagaur and 14 per cent in Shekhawati deemed it successful. As compared to other extension messages, its rate of success is very high.

The quality of seeds is a major determinant of agriculture production. In Nagaur region 75 per cent and Shekhawati, 89 per cent respondents obtain advice for better seed quality and related aspects. The respondents, which used improved seeds, also opted for help regarding the financial support. This corresponds to 34 per cent in Nagaur region and 42 per cent in Shekhawati region. More than 50 per cent respondents used improved seeds in both the regions, whereas 34 per cent in Nagaur region and 41 per cent in Shekhawati region deemed it successful. In the villages of Rolchandawata and Saranwas of Nagaur region and Bangothrikalan and Kishorpura of Shekhawati region, more than 70 per cent respondents are using it. The quality seed for pulses and oilseeds are distributed under various government programs like National Food Security Mission (NFSM). The farmers mostly use improved seeds producing spices and vegetables.

Water availability is a major problem in dry land farming areas [13]. Various institutions have worked for the dissemination of irrigation and water harvesting technology. Both in Nagaur and Shekhawati regions, percentage of respondents seeking advice for irrigation technology is 46 per cent and 59 per cent respectively, out of them 25 per cent respondents in Nagaur region and 32 per cent in Shekhawati region adopted these technologies. Percentage of respondents who considered it successful is in Nagaur and 24 in Shekhawati region respectively. The farmers which successfully adopted the irrigation technology are concentrated in Rolchandawata and Saranwas of Nagaur region and Jagdishpura, Kishorpura and Bangothrikalan of Shekhawati region.

On the other hand, respondents are very much aware of water harvesting technologies. Percentage of the respondents, who successfully adopted this technology, are 67 per cent in Nagaur and 60 per cent in Shekhawati regions respectively. The respondents which are getting financial help accounted for 51 per cent and 49 per cent for Nagaur and Shekhawati regions respectively. In the areas of dry land farming the practices of Agro - processing, agro - forestry and diversification have high potential to increase the income of the farmers. However, there are very few respondents, who adopted these practices. Agro - processing is in the worst condition amongst all the three. Saranwas village of Nagaur region and the Jagdishpura village of Shekhawati are the two villages where respondent adopted the agro - processing techniques. No other respondent from any other village is practicing this.

Although the respondents who were seeking advice for agro - forestry are 49 per cent in Nagaur and 51 per cent in Shekhawati region, whereas 12 per cent and 15 per cent adopted this from Nagaur and Shekhawati regions respectively. These respondents are mainly concentrated in the villages of Rolchandawata and NandoliMertiya of Nagaur region and Kishorpura and Jagdishpura village of Shekhawati region. The activities of diversification are also unsatisfactory. Percentage of respondents largely seeking advice for diversification is 39 per cent in Nagaur region and 40 per cent in Shekhawati region respectively. Whereas 11 per cent in Nagaur region and 15 per cent in Shekhawati region accounted for their adoption. only 4 per cent respondents in Nagaur region and 7 per cent in Shekhawati region considered it successful.

At the village level, this practice is concentrated in a few of them like Rolchandawata of Nagaur region and Jagdishpura of Shekhawati region. Both the villages have a high share of irrigated land. Importance can be given to medicinal plants like Aloe Vera and Jatropha, but because of the absence of market linkages farmers are unable to gain profits.

Level of Livestock Extension Message Dissemination

Livestock rearing is the main occupation in the dry land areas. It not only increases the income of farmers, but it supplements essential nutrient elements in food and helps in reducing malnutrition. At the time of drought and famine, when crops get destroyed it works as insurance [14]. Productivity is not satisfactory in dry land areas. The government has tried to use modern and scientific ways to increase the productivity of livestock [15].

Livestock extension message dissemination is being done to diffuse the reach of modern and scientific ways to the farmers. This is analyzed in the [Table-6] and [Table-7] for Nagaur and Shekhawati regions respectively. Around 65 per cent respondents of Nagaur region and 71 per cent of Shekhawati region have sought advice for feeding. Fifty-four per cent in Nagaur and 61 per cent of respondents in Shekhawati region adopted proper feeding methods, whereas, 39 per cent in Nagaur region and 43 per cent in Shekhawati region considered it successful. In this regard, least respondents are from Raisinghpura in Nagaur region and Sawai Laxmanpura in Shekhawati region.

Approximately 39 and 41 per cent of respondents for the Nagaur and Shekhawati regions adopt the dissemination message regarding housing respectively, and 35 and 39 per cent from Nagaur and Shekhawati deemed it successful.

Housing-related activities are different for different animals. Better housing arrangements are done for milch animals. Apart from that according to the socio-economic status of the respondents, the housing arrangement for the animals differs. In the matter of milch animals having knowledge of proper milking techniques and milk hygiene is necessary. Respondents seeking advice in this regard are 69 and 92 per cent in Nagaur region and 74 and 98 per cent in Shekhawati region. Respondents, which adopted milk hygiene, are more than the respondents aware of proper milking. Dholiya and Raisinghpura from Nagaur region and Naya Bas, Jhajjar and Jagdishpura from Shekhawati regions are some villages, which performs better on these indicators.

Respondents seeking advice for disease control and establishment of pasture are 55 and 65 per cent in Nagaur region and 65 and 64 per cent in Shekhawati region. Activities related to pasture establishment are not yet successful despite government efforts. Twenty per cent respondents in Nagaur region and 27 per cent respondents in Shekhawati region considered it a success. In irrigated villages like Rolchandawata in Nagaur and Jagdishpura in Shekhawati region green fodder is always available. It is a tradition to keep land fallow for pasture. Traditional methods are used to store the animal products. The cooperative dairy structure is developed in this region, which has highest share in milk storage. Almost every village has cooperative milk center.

Processing and marketing play an imperative role in the value addition of animal products. The cooperative structure is developed mainly for the treatment and marketing of milk, but members of cooperatives are limited. Hence, the stockholders are not able to make an adequate and substantial profit. Appropriate processing and marketing structure are not developed for other animal products like meat, wool, etc. The respondents, which make processing activities successful, are 2 per cent and 3 per cent, for marketing it is 21 and 24 per cent in Nagaur and Shekhawati regions respectively. That indicates towards the lack of appropriate backward and forward linkages

Perception of Farmers Regarding Constraints in Extension Services

Modern techniques developed by the agricultural development agencies, have not yet effectively reached to the farmers. Farmers are facing difficulties in adopting those technologies. To show the success and effectiveness of extension message, it is important to identify the hurdles coming across the way and then analyzing them. In this sequence the problems faced by the respondents of Nagaur and Shekhawati region are considered and analyzed [Table-8].

Table-8 Perception of Farmers Regarding Constraints in Extension Services

Major Issues	Nagaur	Shekhawati
Lack of Personal Contribution	69	71
Financial Issues	95	75
Not Understandable	91	69
Unpractical Message	84	72
Ignorance	49	32
Lack of Labor	21	49
Negative Experience	65	51

For both the regions, the biggest problem in adopting the extension message is the financial responsibilities, which are linked with it. The income level of the farmers is minuscule, or do not have risk bearing capacity. In Nagaur region, 95 per cent respondents, whereas, in Shekhawati region, 75 per cent respondents considered it as a major hurdle. In the villages of Dholiya and Raisinghpura, all the respondents considered it as a major constraint.

In Nagaur region, 91 per cent, whereas in Shekhawati region, 69 per cent respondents have a view that extension messages are not understandable. Which is indicating towards the weak communication system of extension messages. Eighty-four per cent respondents from Nagaur and 72 per cent from Shekhawati region considered extension message unpractical. This fact is a subject of concern. On one hand it is unveiling the fact that agricultural scientists are not aware of the actual problems of the farmers, on the contrary it is indicating towards the weak attitude of innovation and prevailing cultural standoff of farmers. Non-irrigated villages have more respondents in comparison to villages having better irrigate facilities, in this regard.

The Percentage of respondents who adopted different extension message are 65 per cent from Nagaur region having negative experience regarding these services, whereas in Shekhawati region this number stands at 51 per cent. The reason behind this is the lack of coordination among different service providing institutions, lack of development of proper delivery mechanism and lack of appropriate training programs. Ignorance is also considered as a major barrier as 49 per cent respondents in Nagaur region and 32 per cent in Shekhawati region considered it as a major drawback. Low level of literacy among farmers, social and cultural barriers, delay in results and lack of appropriate supporter mechanism are inducing the tendency of ignorance. Labor is also critical to apply extension message. Only a few respondents from both the regions considered that factor a major barrier that is 21 per cent in Nagaur region and the 49 per cent Shekhawati region. In Shekhawati, the significant labor force is engaged in secondary and tertiary activities, and less labor force is available for agriculture activities.

Conclusion and suggestions

The study identifies several challenges which are faced by the farmers in adopting extension services in the Nagaur and Shekhawati regions. These include inadequate accessibility to extension services, lack of trained extension personnel, and insufficient collaboration between farmers, researchers, and policymakers. Addressing these challenges requires strong will of the local institutions and the state government. Interventions such as training for extension personnel, increased farmer participation, and improved infrastructure for knowledge sharing and dissemination. The findings of this study have significant implications for policy and practice in agricultural extension services in dryland regions of Nagaur and Shekhawati. They provide valuable insights into the strengths and weaknesses of the existing extension system, highlighting areas for improvement and innovation. Use of mass media and mobile platform in the local language to create awareness about the potential of practices will go a long way to help farmers adopt new practices. There needs to be convergence between the krishi Vikas kendras and the ATMA to make extension effective. It is completely possible to employ the village messenger to disseminate the information on extension. Another feature could be the utilisation of village fairs and melas as a platform to disseminate information. Lastly, increasing rural literacy and spread of Information and communication technology tools can prove to be valuable assets in providing valuable information to the farmers. This research is a clarion call to the policy makers of the state to take suitable steps to overcome all the barriers faced by the farmers in reaping the benefits of the agricultural extension services and make them more competitive in this era of globalization.

Application of research: The role of agricultural extension services in dryland farming, particularly in Nagaur and Shekhavati regions of Rajasthan, is important for encouraging sustainable agricultural practices, increasing productivity, enhancing livelihoods, and mitigating the challenges associated with arid and semi-arid conditions.

Research Category: Agricultural Extension, Dryland Farming

Acknowledgement / Funding: Authors are thankful to University Grants Commission (UGC), India for the research scholarship. Authors are also thankful to Department of Geography, Shyama Prasad Mukherji College, Punjabi Bagh, Delhi, 110026, University of Delhi, Delhi, 110007, India

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University: University of Delhi, Delhi, 110007, India

Research project name or number: PhD Thesis

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Nagaur and Shekhavati regions of Rajasthan

Cultivar / Variety / Breed name:

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

References

- [1] Jones Gwyn E., and Chris Garforth (1997) The History, Development, and Future of Agricultural Extension in Improving Agricultural Extension: A Reference Manual. Rome: Food and Agricultural Organization of the United Nations.
- [2] Bindu P. & Bindu B. (2018) *Indian journal of extension education and rural development Rajasthan society of extension education*, 26, 139-142.
- [3] Oakley P. and Garforth C. (1985) *Guide to extension training. Food and agriculture organization of the United Nations, Rome*. Retrieved from <https://www.fao.org/3/t0060e/t0060e03.htm>
- [4] Swanson B. E., Riikka R. (2010) Agriculture & Rural development discussion paper; no. 45. Washington, DC: World Bank2.
- [5] Davis Kristin E., et al. (2014) *The role of extension and advisory services in building resilience of smallholder farmers*, 2020 Conference Brief, May 17-19, Addis Ababa, Ethiopia. Washington, D.C.: International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/128155>
- [6] Sulaiman V. (2018) *Agricultural extension in India: current status and ways forward* https://www.aesanetwork.org/wp-content/uploads/2018/08/sulaiman_ag_extension_india.pdf
- [7] Planning Commission (2007) *Report of the Working Group on Crop Husbandry, Agricultural Inputs, Demand & Supply Projections & Agricultural Statistics for The Eleventh Five Year Plan (2007-12)*. New Delhi: Planning Commission.
- [8] Saravanan R. (2010) (Ed.) *ICTs for Agricultural Extension: Global Experiments, Innovations and Experiences*, New India Publishing Agency (NIPA), New Delhi.
- [9] Recommendations of working group on agricultural extension for formulation of eleventh five-year plan (2007-12) retrieved from https://agritech.tnau.ac.in/govt_schemes_services/pdf/govt_schemes_extn%20recc.pdf
- [10] Rajasthan - -Agriculture Prosperity and Opportunity, Directorate of Agriculture, Govt of Rajasthan retrieved from https://farmer.gov.in/image/default/handbooks/BookLet/RAJASTHAN/20150120164649_Rajasthan%20Agriculture%20Prosperity_and_Opportunity.pdf
- [11] CRIDA (2011) *VISION 2030, Central Research Institute for Dry Land Agriculture, Santoshnagar, Hyderabad, India*, 31.
- [12] Chouhan N., Henry C. and Solanki D.K. (2013) *Indian Journal of Extension Education*, 49(3&4), 102-106.
- [13] Koohafkan P. and Stewart B.A. (2008) *Water & Cereals in Dry Lands. Rome: Food & Agriculture Organization of the United Nations*.
- [14] Hanumantha Rao, et al. (1988) *Unstable Agriculture and Droughts: Implications for Policy*. Vikas Pub. House, New Delhi.
- [15] Planning Commission (2006) *Report of the Working Group on Crop Husbandry, Agricultural Inputs, Demand & Supply Projections & Agricultural Statistics for The Eleventh Five Year Plan (2007-12)*. New Delhi: Planning Commission.