The Pharma Innovation

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Profile characteristics of farmers regarding solar energy utilization in farming system

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Abstract
The present study explored the profile characteristics of farmers regarding solar energy utilization in farming system. The study was conducted in the Marathwada region of Maharashtra state during the year 2020-21. Parbhani district was selected randomly from Marathwada region. Three talukas and four villages from each selected talukas were selected randomly from the Parbhani district for the study. Ten respondents from each selected village were selected randomly, in this way the total 120 respondents were considered for the present investigation. An Ex-post-facto research design was followed for the study. Data was gathered using a well-structured interview schedule created with the study's objective in mind. The collected data was analysed, classified, and tabulated. Statistical tools such as frequency, percentage, mean, standard deviation, and coefficient correlation were used to interpret findings and draw conclusions. The detailed analysis of profile characteristics of farmers indicated that the majority (53.33 per cent) of the respondents belonged to the middle age group, one third (38.33 per cent) of the respondent were educated up to high school level, half (50.00 per cent) of the respondents were small land holders, majority (66.67 per cent) respondent had medium family size, majority (83.33 per cent) of the respondents belonged to medium level of annual income i.e., Rs. 50120/- to Rs. 252296/-, more than half (53.33 per cent) of the respondents had fair irrigation status, two-third (65.00 per cent) of the respondents had medium extension contact, three-fifth (60.00 per cent) of the respondents had medium economic motivation, majority of (72.50 per cent) of the respondents had medium level of risk orientation and significant percentage (60.83 per cent) of the respondents had medium level of scientific orientation.

Keywords: profile characteristics of farmers, solar energy utilization, farming system

Introduction
The economic growth of any nation depends upon the development of trade, commerce, industry and other allied activities. The economic prosperity of India is dependent on various facilitating factors which includes basic infrastructure development and sustainable energy development and availability at the primary level. There exists a strong integration between economic development and energy consumption. To maintain one's economical growth and be in pace with global competitiveness, the availability of cost-effective and eco-friendly energy sources plays a definite role and on the other hand, the demand for energy seems to regulate economic development. India is predominantly dependent on fossil source of energy like coal to meet most of its demand but reckless use of these fossil fuel-based energy poses a threat to the sustainable development of the people and the nation as a whole by affecting the environmental conditions. Exploitation of the non-renewable energy resources and depletion of the natural reservoirs through imbalanced use has become a matter of concern for the entire world. To meet these challenges, emphasis should be given on effective utilization of renewable energies and necessitating the countries to aggressively increase the usage of renewable energy sources like bio-energies, geothermal energy, small-hydro, solar and wind energy. Solar energy is the radiant light and heat from the sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis. A farming system is defined as a population of individual farm units that have similar resource base, enterprise pattern, household livelihoods and constraints for which similar development strategies and interventions would be appropriate. Renewable energy like solar, wind etc. plays a major role in creating a reliable and clean energy future and its application in agriculture sector would bring the much-needed benefits to the farmers and farming community in general. With this background in mind the current research was conducted to study the profile characteristics of farmers regarding solar energy utilization in farming system.

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Materials and Methods

The study was conducted in the Marathwada region of Maharashtra state during the year 2020-21. Parbhani district was selected randomly from Marathwada region. Three talukas and four villages from each selected talukas were selected randomly from the Parbhani district for the study. Ten respondents from each selected village were selected randomly, in this way the total 120 respondents were considered for the present investigation. An Ex-post-facto research design was followed for the study. Data was gathered using a well-structured interview schedule created with the study's objectives in mind. The collected data was analysed, classified, and tabulated. Statistical tools such as frequency, percentage, mean, standard deviation, and coefficient correlation were used to interpret findings and draw conclusions.

Results and Discussion
Profile Characteristics of farmers

Table 1: Characteristics of farmers

Sr. No.	Characteristics	Farmers (n = 120)	
		Frequency	Percentage
1	**Age**		
	Young (Up to 28 years)	30	25.00
	Middle (29 to 53 years)	64	53.33
	Old (54 years & above)	26	21.67
2	**Education**		
	Illiterate	0	0
	can read & write only	0	0
	Primary school level (1st - 7th)	26	21.67
	Middle school level (8th - 10th)	28	23.33
	High school level (11th - 12th)	46	38.33
	Graduate	20	16.67
3	**Land holding**		
	Marginal (up to 1.00 ha)	31	25.83
	Small (01 to 2.00 ha)	60	50.00
	Semi medium (2.01 to 4.00 ha)	22	18.33
	Medium (4.01 to 10.00 ha)	6	05.00
	Large (above 10.00 ha)	1	0.84
4	**Family size**		
	Small (up to 4 members)	30	25.00
	Medium (5 to 7 members)	80	66.67
	Large (8 & above members)	10	08.33
5	**Annual income**		
	Low (Up to Rs. 50119)	7	05.83
	Medium (Rs. 50120 to Rs. 252296)	100	83.33
	High (above Rs. 252297)	13	10.84
6	**Irrigation status**		
	Poor	39	32.50
	Fair	64	53.33
	Good	17	14.17
7	**Extension contact**		
	Low (up to 33)	17	14.17
	Medium (34 to 42)	78	65.00
	High (43 & above)	25	20.83
8	**Economic motivation**		
	Low (up to 24)	20	16.67
	Medium (25 to 28)	72	60.00
	High (29 & above)	28	23.33
9	**Risk orientation**		
	Low (up to 24)	23	19.17
	Medium (25 to 28)	87	72.50
	High (29 & above)	10	8.33
10	**Scientific orientation**		
	Low (up to 25)	32	26.67
	Medium (26 to 28)	73	60.83
	High (29 & above)	15	12.50

Age

The data in the above table 1 revealed that, majority (53.33 per cent) of the respondents belonged to middle age group, followed by 25.00 per cent were young category and 21.67 per cent of the respondents belonged to old age category. This indicates that most of the respondents were middle aged group. This could be those young and middle-aged farmers, as opposed to older farmers, are risk takers, energetic, enthusiastic, innovator and eager to accept new technologies. The above result was in line with Swetha Rani (2015) [9].

Education
The data in the above table 1 disclosed that, more than one third (38.33 per cent) of the respondent were educated up to high school level, followed by 23.33 per cent were educated up to middle school level, 21.67 per cent educated up to primary school level and 16.67 per cent educated up to graduation level. The percentage of illiterate, can read and only write were zero. Education is the key to success and plays a significant part in encouraging and attracting people who are interested in learning more about solar technology. From the given data majority of respondents from high school level because the respondents lived close to a city or a good sort of educational institution, they had a better probability of upgrading their educational level. The majority of the respondents were aware of the importance of education and its advantages. The above result was in accordance with Patidar and Patidar (2015) [6].

Land holding
The above table 1 revealed that, half (50.00 per cent) of the respondents belonged to category of small land holding, followed by 25.83 per cent of the respondents belonged to marginal category, 18.33 per cent were belonged to semi-medium category, 05.00 per cent were from medium category and 0.84 per cent of respondents belonged to large category of land holding. The most probable cause is the ancestral land transfer from generation to generation, as well as other factors such as increased population on land. The more land fragmentation there is, the smaller the farm becomes. As a result, the bulk of the farmers had small land holding. The above result was in lined with Kumar (2007) [2].

Family size
It was observed that, the majority (66.67 per cent) of the respondent had medium family size where as 25.00 per cent of the respondents had small family size category and remaining 08.33 per cent belonged to a large family size category. Farmers families may be shortened as a result of their forward-thinking about family planning. Another reason could be social changes and the desire of the new generation to maintain their individuality rather than live in a joint family. The result was in line with the earlier findings of Meena *et al.* (2009) [4].

Annual income
Table 1 revealed that, majority (83.33 per cent) of the respondents belonged to medium level of annual income, where as 10.84 per cent were high level of annual income and only 05.83 per cent of the respondents had low level of annual income. Data disclosed maximum farmers had medium level of annual income this could be because farming is the primary source of income for the majority of farmers. The majority of the farmers possessed small and marginal land holding. However, productivity is low for a variety of reasons, and marketing facilities are also lacking. The above results wan in accordance with Sona and Muniraju (2018) [8].

Irrigation status
The data from the above table 1 disclosed that, more than half (53.33 per cent) of the respondents had fair irrigation status, while 33.50 per cent had poor irrigation status and 14.17 per cent of the respondents had good level of irrigation status. According to data majority of farmers had fair irrigation status this could be because most of the farmers had small and marginal land holding. The result was in line with the earlier findings of Thakare (2013) [10].

Extension contact
The above table 1 indicated that, two third (65.00 per cent) of the respondents belong to medium extension contact category, where as 20.83 per cent belong to high extension contact category and 14.17 per cent of the respondent belong to low extension contact category. The most probable cause is that the majority of farmers fall into the medium extension contact group because they seek assistance from local extension workers or agricultural officers to solve their problems at the local level. Farmers with a large number of extension contacts are more likely to be aware of the latest technology. The above result was in accordance with earlier findings of Rohini (2011) [7].

Economic motivation
The above table 1 indicated that, three fifth (60.00 per cent) of the respondents had medium economic motivation, while 23.33 per cent of the respondents had high economic motivation and 16.67 per cent of the respondent had low economic motivation. It can be stated that, maximum proportion of the respondents had medium economic motivation due to most of the farmers having medium annual income. The above findings were in accordance with Mane (2012) [3].

Risk orientation
The above table 1 revealed that, large majority of (72.50 per cent) of the respondents had medium level of risk orientation, where as 19.17 per cent were low level of risk orientation and only 08.33 per cent of the respondents had high level of risk orientation. The probable reason for majority of respondents had a medium risk orientation could be due to the fact that respondents in the small and semi-medium land holding group were able to assume more risk than marginal respondents. Other probable causes include a medium degree of knowledge about solar energy utilization and a medium annual income as barriers to taking a big risk. The findings were in concordance with an earlier study by Kale and Kadam (2012) [1].

Scientific orientation
The above table 1 revealed that, significant percentage (60.83 per cent) of the respondents had medium level of scientific orientation, while 26.67 per cent were low level of scientific orientation and 12.50 per cent of the respondents had high level of scientific orientation. The aforementioned outcome might be attributable due to the significant percentage of farmers education falls in high school level category, medium knowledge level, marginal and small land holdings and a medium level of annual income. Farmers have been encouraged to embrace new solar equipment due to the medium scientific orientation. The above result was in line with findings of Pandey *et al.* (2011) [5].

Conclusion
The study conclusively proven that profile characteristics of farmers regarding solar energy utilization in farming system, majority of the respondents belonged to middle age group, more than one third of the respondent were educated up to high school level, half of the respondents belonged to category of small land holding, majority of the respondent had medium family size, majority of the respondents belonged to

medium level of annual income, more than half of the respondents had fair irrigation status, nearly two third of the respondents belong to medium extension contact category, three fifth of the respondents had medium economic motivation, majority of the respondents had medium level of risk orientation, significant percentage of the respondents had medium level of scientific orientation.

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