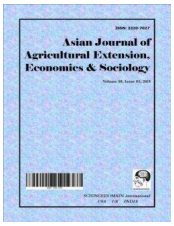

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Perceived Attributes of Soybean Production Technologies

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Authors' contributions

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ABSTRACT

The study was an *"expost-facto"* research carried out in Dharwad district of Karnataka State during the year 2013- 14. In Dharwad district, three taluks were selected based on the highest area under Soybean crop cultivation. The total sample size was 150. The results revealed that relative advantages of soybean production technologies were 95.24 per cent, followed by 97.33 per cent of the technologies were found to be compatible, but 47.69 per cent technologies were found complexity, 91.84 per cent of technologies were observability of results and 94.14 per cent of technologies can be trialable in small scale. The overall perceived attributes of soybean production technologies effectiveness were found to be 86.17 per cent. The probable reason might be the soybean production technology having high relative advantage, compatibility, observability, trialability and very less complexity. Hence the appropriate educational activities like demonstrations, field days etc. should be undertaken to reduce the remaining complexity of the technology.

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Keywords: Relative advantage; compatibility; complexity; observability; trialability and technology effectiveness.

1. INTRODUCTION

Soybean [*Glycine max* (L.) Meril] is one of the oldest cultivated crops of the world. The first record of this crop is available in Chinese literature, where it is mentioned to be one of the five sacred grains of China country. Soybean is known as "Golden bean", "Miracle crop", due to its several uses. Soybean besides having high yield potential (30-35q/ha), Provides cholesterol free oil 20 per cent and high-quality protein 40 per cent. It is a versatile crop with innumerable possibilities of improving agriculture and supporting industry. The soybean protein is rich in Lycine 5 per cent and the oil extracted is edible one. India is in short supply of proteins and a large portion of the population are vegetarians, under this situation crop like soybean with high protein content and high yield potential became an important crop in India. Chhidda Singh et al. [1].

To increase the soybean production and productivity, there is an urgent need to diffuse the improved production technologies to the soybean farmers. Extension agencies of both public and private sector should effectively involve in the transfer of improved soybean technologies to the farmers. But the pattern of technology transfer is not the only important factor for effective transfer of technology, but perceived attributes of technology are also the important factors affecting the transfer of technologies. Each and every technology has some qualities as farmer perceive them. Therefore, before a farmer adopts any new farm technology or innovation he should consider the attributes of a farm technology. Hence, the attributes or characteristics of a farm technology have a significant role to play in its adoption Rogers [2].

Perception is an activity through which an individual becomes aware of objects around oneself and of events taking place. In view of this Rogers [2] has given five attributes of innovations, relative advantage, compatibility, complexity, observability and trialability. These five attributes according to Rogers will decide the rate of adoption of innovations in a social system. Hence, in this context, the present study was undertaken to study the perceived attributes of soybean production technology.

1.1 Perceived Attributes of Innovation

1. **Relative Advantage:** It is a degree to which an innovation is perceived as being better than the idea it supersedes.
2. **Compatibility:** It is a degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters.
3. **Complexity:** It is a degree to which an innovation is perceived as relatively difficult to understand and use.
4. **Trialability:** It is a degree to which an innovation may be experimented with on a limited basis.
5. **Observability:** It is a degree to which the results of an innovation are visible to others.

2. MATERIALS AND METHODS

The study was an *"expost-facto"* research carried out in Dharwad district of Karnataka State during the year 2013- 14. Dharwad, Hubli and Kalaghatagi taluks were selected based on highest area under Soybean crop cultivation. In selected taluks, seven villages were selected from Kalaghatagi based on highest area under Soybean crop, similarly, five villages from Dharwad and three villages from Hubli taluks were selected. From each village, ten farmers were selected randomly.

Hence, the study covered 15 villages from 3 taluks of Dharwad district to form a sample of 150 respondents. A pre-tested structured interview schedule was used to collect the data from the respondents by personal interview method. The data collected from respondents were tabulated and analyzed using appropriate statistical tools such as frequency, percentage mean and standard deviation.

A teacher made a test to measure the Perceived attributes of soybean production technology was developed based on the suggestions of Anastasi [3]. Statements were developed for soybean production technology after elaborate discussion with extension workers and other scientists. Finally, 36 items related to perceived attributes of soybean production technology felt most relevant by the experts were selected for the study. These statements were further edited, revised and finalized. These 36 statements were

administered to 150 respondents to assess their perception of soybean production technology. The responses of the respondents against each item were recorded. These items were rated on a three-point continuum *viz.,* agree, undecided and disagree with scores 3, 2, 1 respectively. The minimum and maximum scores were 36 and 108 respectively. The total perception score for an individual respondent was calculated by summing up the number of sub items as perceived by the individual farmer.

> Perceived attributes of each technology index = [(Sum of actual score obtained from 150 respondents / Sum of the maximum possible score for 150 respondents x 100)]

Technology effectiveness: In technology effectiveness, statements of perceived attributes of soybean production technologies are the important measures.

> Techno Effectiveness = (Relative Advantage + Compatibility + Complexity + Observability + Trialability / 5)

3. RESULTS AND DISCUSSION

3.1 The Relative Advantage of Soybean Production Technologies as Perceived by the Farmers

The results in the Table 1 indicated that, 98.66 per cent of the respondents agreed that soybean seeds are less affected in storage situation, followed by 97.33 per cent of respondents agreed for soybean crop improves the soil fertility, 96.00 per cent of the respondents agreed that soybean was low cost of cultivation crop, 95.33 per cent of the respondents agreed that soybean crop meets the need of cattle feed, 92.66 per cent of the farmers agreed that soybean crop is an early maturity crop, 92.00 per cent of the respondents agreed that soybean crop helps in double cropping system in a year, 86.00 per cent of the respondents agreed that soybean crop has better market prices compared to other crops, 82.00 per cent of the respondents agreed that soybean crop get an assured yield.

The probable reason might be that soybean can be store for a 1-2 year because it having a capacity of tolerance to storage pests. The farmers can easily store their produce for some time to get a better price if the prices are less at the time of harvest because of more moisture content in seed at the time of harvest. Soybean is a leguminous crop, it helps in nitrogen fixation. Farmers can get higher yield if they take up cereals crop in Rabi season as crop rotation system. For soybean crop, farmers can use fewer pesticides, with required recommended fertilizers and weedicides which helps to reduce the cost of cultivation. If a farmer grows a soybean, he can get 8-10q/acre seeds and 7-8 q/acre straws and soybean straw are very much nutritious having a higher percentage of protein. This helps farmers to prepare the land and keep ready for sowing in the rabi season and to take up other activities. Soybean is short duration crop, it comes to maturity within 3 months. It helps to grow another crop in rabi season and also get sufficient time to prepare the land and some other activities for further cultivation. The market price of the soybean is good compared to other crops. Soybean is a short duration crop; it comes to maturity 85 to 90 days. Usually, the farmers can get Soybean yield 8-10 q/acre. It is tolerant to pest and disease and also drought resistant to some extent. The results are line with Vasantha [4] and Karthik [5].

3.2 Compatibility of Soybean Production Technologies as Perceived by the Farmers

The data in the Table 1 revealed that cent per cent of the farmers agreed that soybean crop is feasible in present suitable situations, fits well in the cultural aspects in a social system, further it will meet out the needs and interests on a wide range of farmers, similarly it is suitable for all types of land holdings and suitable for different cropping systems. The results also reveal that 90.66 per cent of the respondents agreed that soybean crop is economically compatible to all types of farmers, 89.33 per cent of the respondents agreed that it can be grown successfully by using local resources, 86.66 per cent of the respondents agreed that soybean crop is suitable for all seasons.

The reason for this could be improved soybean production technologies are in harmony with the previous practices followed by the farmers, consistence with the existing situation and compatible with norms and culture. These are most important factors for accepting the improved soybean production technologies because of its easiness in cultivation aspect compare to other crop production technologies and farmers perceived that improved soybean production technologies meet the felt needs of farmers. The further soybean crop is suitable for

Table 1. Perceived attributes of soybean production technologies as perceived by the farmers (N=150)

Sl. no.	Perceived attributes	Response categories						Perceived attributes index
		Agree		Undecided		Disagree		
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
	Relative advantage							
1	Less affected by storage pests.	148	98.66	0	0.00	2	1.33	99.11
2	Improves soil fertility	146	97.33	0	0.00	4	2.66	98.22
3	Low cost of cultivation	144	96.00	2	1.33	4	2.66	97.77
4	Meets need of cattle feed	143	95.33	1	0.66	6	4.00	97.11
5	It is an early crop	139	92.66	2	1.33	9	6.00	95.55
6	Double cropping easier	138	92.00	2	1.33	10	6.66	95.11
7	Better market prices compared to other crops	129	86.00	2	1.33	19	12.66	91.11
8	Assured yield	123	82.00	0	0.00	27	18.00	88.00
	Average relative advantage							**95.24**
	Compatibility							
1	Feasible in present situation	150	100.00	0	0.00	0	0.00	100.00
2	It will meet the needs and interests of a wide range of farmers	150	100.00	0	0.00	0	0.00	100.00
3	It fits well in the cultural aspects in a social system	150	100.00	0	0.00	0	0.00	100.00
4	Suitable for all types of land holding	150	100	0	0.00	0	0.00	100.00
5	Suitable for different cropping system	150	100	0	0.00	0	0.00	100.00
6	It is economically compatible to all types of farmers	136	90.66	1	0.66	13	8.66	94.00
7	It can be grown successfully by using local resources	134	89.33	0	0.00	16	10.66	92.88
8	Suitable for all seasons	130	86.66	1	0.66	19	12.66	91.77
	Average compatibility index							**97.33**
	Complexity							
1	Rainfall at harvesting time, affecting grains quality	47	31.33	4	2.66	99	66.00	55.11
2	Difficulty in plant protection measures	46	30.66	4	2.66	100	66.66	54.66
3	Difficulty in seed treatment	43	28.66	3	2.00	104	69.33	53.11

Sl. no.	Perceived attributes	Response categories						Perceived attributes index
		Agree		Undecided		Disagree		
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
4	Non availability of high yielding varieties	29	19.33	5	3.33	116	77.33	47.33
5	Difficulty in adoption of improved production technologies of soybean in the field	28	18.66	2	1.33	120	80.00	46.22
6	Difficulty in harvesting with respect to shattering	19	12.66	6	4.00	125	83.33	43.11
7	Difficulty in understanding improved soybean production technologies	16	10.66	3	2.00	131	87.33	41.11
8	High degree of uncertainty of soybean crop	15	10.00	4	2.66	131	87.33	40.88
	Average complexity index							**47.69**
	Observability							
1	Decrease in weed, pests and disease incidence	136	90.66	2	1.33	12	8.00	94.22
2	Decrease in quantity of use of fertilizers and pesticides	135	90.00	2	1.33	13	8.66	93.77
3	Decrease in cost of cultivation	129	86.00	4	2.66	17	11.33	91.55
4	The good growth of soybean crop in all seasons will give visual impact to others	129	86.00	2	1.33	19	12.66	91.11
5	The performance of results of soybean yield can be easily communicated to others	129	86.00	0	0.00	21	14.00	90.66
6	Uniformity of crop maturity	126	84.00	2	1.33	22	14.66	89.77
	Average observability index							**91.84**
	Trialability							
1	Crop grown as a different cropping system	145	96.66	0	0.00	5	3.33	97.77
2	Crop can be tried on a small scale	143	95.33	0	0.00	7	4.66	96.88
3	Plant protection measures can be tried on a small scale	142	94.66	1	0.66	7	4.66	96.66
4	Crop can be grown by any category of farmers	138	92.00	0	0.00	12	8.00	94.66
5	Crop can be grown in the back yard for trial	126	84.00	3	2.00	21	14.00	90.00
6	Can be tried in all seasons	122	81.33	6	4.00	22	14.66	88.88
	Average trialability index							**94.14**

inter crop with pigeon pea, cotton, maize, tobacco and mixed crop with finger millet, sugarcane, paddy. The reason for this could be soybean crop have a low cost of cultivation compared to other crops and it is suitable for all socio-economic status of the farmers. The reason for this could be farmers are using local resources like FYM, vermicompost, bio-fertilizers, own seeds, bullocks and also it can be harvest manually. The soybean crop is compatible with tropical, sub-tropical and temperate regions. Further, it is grown under optimum temperature of 25-35°C and also suited to both rainfed and irrigated condition. It is quite challenging to the scientists to evolve high yielding varieties of soybean compared to cereals crops. Now present varieties are compared to cereals they are lower yields. The adoption of new production technologies depends on various factors such as complexity of practice, timely availability of inputs, characteristics of farmers and also other reasons are lack of knowledge, difficulty in use and cost of technologies. Similar results were reported by Vasantha [4] and Karthik [5].

3.3 The Complexity of Soybean Production Technologies as Perceived by the Farmers

The results in the Table 1 indicated that 31.33 per cent of the respondents disagreed that, rainfall at harvesting time, affecting grains quality, followed by 30.66 per cent of the respondents disagreed that difficulty in plant protection measures, 28.66 per cent of the respondents disagreed that difficulty in seed treatment, 19.33 per cent of the respondents disagreed that non availability of high yielding varieties, 18.66 per cent of the respondents disagreed that difficult in adoption of improved production technologies of soybean in the field, 12.66 per cent of the respondents disagreed that difficulty in harvesting with respect to shattering, 10.66 per cent of the farmers disagreed that difficulty in understanding of soybean production technologies, 10.00 per cent of the respondents disagreed that high degree of uncertainty of soybean crop.

The predominant reason might be alternate wetting and drying of the crop during harvesting time because of erratic behaviour of rainfall, soybean loses its viability and other reasons like rainfall during harvesting time affected the seeds quality and seeds become black colour i.e. because of black colour seeds farmers get the low price in the market. The bacterial leaf spot disease was the severe problem in recent years and also farmers are lack of knowledge in plant protection measures use and these measures are high cost. Some farmers reported that they did not know about the integrated pest management. It may be due to lack of knowledge about seed treatment and non-availability of thiram and rhizobium culture in the village and also while treating the seeds farmers are faced the problems like their hands and cloths are darken, powder dusting in the eyes during sowing creates burning of hands and eyes. If farmers keep matured crop in the field more days, the soybean seeds will be shattered because of sunlight, so farmers can harvest the crop at a proper time, otherwise farmers will get lesser yield. It may be due to lack of educational and technical guidance regarding the understanding of soybean production technologies, failure of rainfall, natural hazards and price fluctuation in the market. The findings were similar to the findings of Vasantha [4] and Karthik [5].

3.4 Observability of Soybean Production Technologies as Perceived by the Farmers

The results in the Table 1 indicated that, majority of the respondents 90.66 per cent agreed that decrease in weed, pests and disease incidence, followed by 90.00 per cent of the respondents agreed that decrease in quantity of use of fertilizers and pesticides can be observed, 86.00 per cent of the respondents agreed that decrease in cost of cultivation, 86.00 per cent of the farmers agreed that good growth of soybean crop in all seasons will give visual impact to others,. 86.00 per cent of the respondents agreed that performance of results of soybean yield can be easily communicated to others, 84.00 per cent of the farmers agreed that uniformity of crop maturity can be observed.

It might be in soybean up to 45 days 2-3 hand weeding are sufficient after 45 days weed incidence very low. It is visible to farmers and others. In case of pests and disease incidence soybean crop needs less plant protection measures because the crop is tolerated to pest and diseases. Only 2-3 pesticides sprayings are sufficient. The soybean crop is a leguminous crop, it fixes the atmospheric nitrogen to the soil i.e. it improves the soil fertility and reduces the fertilizer application. In soybean crop less incidence of weeds, pests and diseases reduced the cost of cultivation. Farmers can easily

observe the performance of soybean in all the season, which season crop performance is good and get a higher yield. soybean results can communicate and visible to others farmers. Uniformity of crop maturity helps to harvest the crop at an appropriate time. If the crop maturity is not uniform farmers need to harvest 2-3 times. It becomes difficult and consumes time and labour. The results are line with Vasantha [4] and Karthik [5].

3.5 Trialability of Soybean Production Technologies as Perceived by the Farmers

The results in the Table 1 indicated that, 96.66 per cent of the respondents agreed that it can be grown in different cropping system, followed by 95.33 per cent of the farmers agreed that it can be tried on a small scale, 94.66 per cent of the respondents agreed that plant protection measures can be tried on a small scale, 92.00 per cent of the farmers agreed that Soybean can be raised by any category of farmers 84.00 per cent of the respondents agreed that it can be grown in the backyard for trial, 81.33 per cent of the respondents agreed that it can be tried in all seasons, It is suited to all seasons. The soybean crop can be taken as a trial on small-scale basis. Farmers can observe soybean crop performance in small scale and see how the crop is responding to different plant protection measures can be easily trialable. The small, medium and big farmers can be raised by this crop and get a good yield. The soybean production technologies can trial on land near houses, not only the main field and it is suited to all the places for a small trial. Soybean can be trial in kharif, rabi and summer seasons and observe its performance. Similar results were reported by Vasantha [4] and Karthik [5].

3.6 The Index Value of Perceived Attributes of Soybean Production Technologies

The index value of innovation attributes was calculated and presented in Table 2. The relative advantages of soybean production technologies are 95.24 per cent, followed by 97.33 per cent of the technology is found to be compatible, but 47.69 per cent was found complexity. The table also indicated that 91.84 per cent of technology is observability of results and 94.14 per cent of technology can be trialability in small scale. In all the above technology the overall effectiveness was found to be 86.17 per cent respectively. The technology having high relative advantage, compatibility, observability, trialability and very less complexity. Hence number of farmers prefers to take up soybean crop. The results are supported by Rathod et al. [6].

Table 2. Index value of perceived attributes of soybean production technologies (n=150)

Variables	Index
Relative Advantage	95.24
Compatibility	97.33
Complexity	47.69
Observability	91.84
Trialability	94.14

Techno Effectiveness = (95.24 + 97.33 + 52.31 + 91.84 + 94.14) / 5 = 86.17

(Complexity index is 47.69, it means 52.31 per cent technology was not complex, hence in the calculations of Techno Effectiveness, index of not complex was considered)

4. CONCLUSION

Results of the study revealed that farmers are having more complexity with respect to seed treatment and application of plant protection measures. Since these practices are important from the point of increasing production and net return, it warrants the attention of extension workers and scientists to intensify their efforts in these areas. The appropriate educational activities like demonstrations, field days etc. should be undertaken to reduce the complexity of the technologies.

5. RECOMMENDATIONS

a) Extension agents by using ICT technologies like soybean mobile app, SMS provide information regarding improved soybean cultivation practices, Integrated Pest Management, weather information, market price, relative advantages of recently developed soybean varieties.
b) Conduct method demonstrations on seed treatment.
c) Conduct result demonstrations of recently developed soybean varieties.

CONSENT

As per international standard or university standard was written participants' consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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