"EXTENT OF ADOPTION OF HYBRID CASTOR PRODUCTION TECHNOLOGY BY THE FARMERS IN KHEDA DISTRICT OF GUJARAT STATE"

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BY

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"EXTENT OF ADOPTION OF HYBRID CASTOR PRODUCTION TECHNOLOGY BY THE FARMERS IN KHEDA DISTRICT OF GUJARAT STATE"

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ABSTRACT

The Gujarat state ranks first in the country with respect to area, production and productivity among all major castor growing states in the country because of adoption of high yielding hybrid varieties grown as irrigated crop. The most important castor growing districts in Gujarat are Mahesana, Sabarkantha, Banaskantha, Kachchh, Ahmdavad, Kheda, Vadodara, Rajkot, Jamnagar, and Gandhinagar. Total area under Castor crop in Gujarat for the year 2007-08 is 354,000 hectares. It has increased by 26% as compared to previous year. Average yield for the year 2007-08 is 1838 kg/hectare as against 1757 kg/hectare during the year 2006-07.

Castor is one of the important non- edible oilseeds cash crops of Kheda district since last ten years because of declination of

tobacco cultivation and availability of remunerative market price. Castor is extensively grown in Kapadvanj, Kathlal and Thasara talukas of the district. The area under castor cultivation of the district is 8172 hectare, and 11030 tone production having with 1350 kg productivity per hectare. Development of new technology is generally not the major problem now-a-days in our country. The main problem as it exits today is that of diffusion and adoption of new farm technologies among to its ultimate users. Looking to the importance and urgency of the problem, a study entitled “Extent of adoption of hybrid castor production technology by the farmers in Kheda District of Gujarat State" was undertaken with the following objectives:

1. To know the some important selective socio-personal, agro-economic, communication and psychological characteristics of the farmers.
2. To ascertain the practice wise knowledge level of the farmers about hybrid castor production technology.
3. To determine the practice wise adoption of hybrid castor production technology by the farmers.
4. To find out the association if any between characteristics of the farmers and their extent of adoption of hybrid castor production technology.
5. To analyze the constraints experienced by the farmers in adoption of hybrid castor production technology.

6. To seek the suggestions from farmers to overcome the constraints faced by them in adoption of hybrid castor cultivation.

On the basis of area covered under hybrid castor cultivation 10 major castor growing villages were selected randomly and among them 120 farmers were selected by proportionate random sampling method. The data were collected with the help of interview schedule by conducting personal interview in the month of November-December, 2008. For measurement of independent and dependent variables, appropriate scales developed and adopted by other researchers were used with due modifications. Frequency, percentage and mean score were used to analyze the data whereas, co-relation co-efficient was calculated to determine the relationship of independent variables with dependent variable.

MAJOR FINDINGS

The important findings of the study are summarized as under:

1. Majority (62.50 per cent) of the farmers were from middle age group.
2. Majority (56.67 per cent) of the farmers had education up to secondary and higher secondary level.
3. Majority (62.50 per cent) of the farmers had medium level (6 to 10 Years) of farming experience.
4. More than three fourth (79.16 per cent) of the farmers were associated with various social organizations,

among them 70.83 per cent had membership in one organization and 8.33 per cent had membership in more than one organizations.

5. Three fourth (75.00 per cent) of the farmers were dependent on farming and animal husbandry for their livelihood, followed by farming along with animal husbandry and farm labouring (16.67 per cent).

6. Majority (62.50 per cent) of the farmers were possessed small to medium size of land holding, among them 37.50 per cent of the farmers were small farmers having 1. 0 to 2.0 ha, land and 20.83 per cent were marginal farmers.

7. Majority (60.00 per cent) of the farmers' possessed three to more than six milch animals, whereas 34.17 per cent of them possessed up to two milch animals.

8. Majority (60.83 per cent) of the farmers utilized various information sources at medium level. Neighbour farmer (68.33 per cent), progressive farmers (65.00 per cent), neighbour and friends (60.00 per cent), agro-service centers (58.33 per cent) and Village Extension Workers (55.00 per cent) were major sources of information to the castor growing farmers in study area.

9. Majority (62.50 per cent) of the farmers had medium level of contacts with different extension agencies, whereas 25.00 per cent and 12.50 per cent farmers had high and low extension contact.

10. More than half (54.17 per cent) of the castor growing farmers had medium level of extension participation, whereas 25.00 per cent of them had high level of extension participation in various extension activities. It means that great majority (79.17 per cent) farmers in study area had medium to high level of extension participation.

11. Majority (62.50 per cent) of the farmers had medium level of scientific orientation, whereas; 25.00 per cent and 12.50 per cent of them had high and low level of scientific orientation respectively.

12. More than half 58.33 per cent of the castor growers had medium economic motivation, whereas 25.00 and 16.67 per cent of the farmers had low and high economic motivation respectively.

13. More than half (54.17 per cent) of the castor growers had medium risk orientation, whereas remaining 25.00 and 20.83 per cent of them had high and low level of risk orientation, respectively.

14. Majority (62.50 per cent) of the castor growing farmers had medium level of knowledge about recommended hybrid castor production technology, whereas 20.83 and 16.67 per cent of them had low and high level of knowledge about recommended hybrid castor production technology.

15. So far practice wise knowledge is concerned, all the respondent farmers' had the knowledge of recommendations namely land preparation and manual weed control. Vast majority of the respondents had high knowledge about the technologies namely, proper time of harvesting (91.67 per cent), inter culturing (86.67 per cent), improved varieties and irrigation (83.33 per cent), time of sowing (76.67 per cent), spacing (70.33 per cent), whereas more than half (54.16 per cent) and half of the respondents (50.00 per cent) were known recommended seed rate and so far fertilizer management is concerned, majority (68.33 per cent) of the farmers had knowledge of FYM application and more than half (54.67 per cent) of them had knowledge recommendations of chemical fertilizers. Whereas more than half (54.16 per cent) and one fourth (25.00 per cent) had knowledge of pest and diseases control. It is interesting to note that very few (16.66 per cent) had knowledge of chemical weed control.

16. Majority (58.33 per cent) of farmers had medium level of extent of adoption of recommended hybrid castor production technology followed by high (16.67 per cent) and low (25.00 per cent) extent of adoption of recommended hybrid castor production technology.

17. Among different recommended hybrid castor production technologies, cent percent of the respondents farmers

followed practice namely land preparation, interculturing, manual weeding and timely harvesting because due to the farming experience farmers know the importance of these farm operations in production of crop.

Majority (62.50 percent) of the farmers used university recommended varieties like GCH-4, GCH-5, GCH-6 and GCH-7. Majority (58.33 per cent) of the farmers sowing their crop at recommended time. Majority (62.50 per cent) of the farmers followed recommended spacing for sowing the castor crop. Slightly more than half (51.67 per cent) of the farmers used recommended seedrate, where as 31.66 and 16.67 per cent of them used more or less quantity of seed rate than the recommendation. Majority (58.33 per cent) of the farmers did not use enough quantity of organic manures in their field. Nearly half (48.34 per cent) of the farmers applied nitrogenous and phosphoric fertilizers as per recommendation, remaining 33.33 per cent and 18.33 per cent of them were used it more or less than recommendation. Less quantity was observed particularly in phosphoric fertilizers while excess use was observed in nitrogenous fertilizers at top dressing. In case of irrigation management, it was observed that very few (16.67 percent) of the farmers applied 8 irrigations as per recommendation, whereas 41.67 per cent and 33.33 per cent applied 5-6 and 3-4 irrigations respectively to their castor field. It is also observed that

65.00 per cent of the farmers adopted pest control measure against castor semilooper and prodenia but none of them adopted control measures for disease control.

18. Out of fourteen independent variables, six variables viz., education, farming experience, occupation, land holding, possession of milch animals, sources of agricultural information, extension contact, scientific orientation, economic motivation and knowledge had positive and significant correlation with the extent of adoption of hybrid castor production.

19. So far constraints faced by the farmers in adoption of hybrid castor production technology are as followed:

Lack of knowledge about recommended dose of fertilizers (65.50 per cent), lack of knowledge about control measures of pests and diseases (58.33 per cent), lack of knowledge about identification of pest and diseases (56.66 per cent) and lack of knowledge about recommended spacing (50.00 per cent) were major technological problems.

High cost of fertilizers and pesticides (65.00 per cent), high cost of labour charges at the time of sowing and picking (61.67per cent), high cost of hybrid seeds (56.67 per cent), high cost of fuel (51.67 per cent) were major economical problem.

Labour shortage at the time of sowing and picking (65.00 per cent), Short supply of fertilizers at required time (58.33 per cent) and irregular supply of canal water for irrigation (50.00 per cent) were major constraints pertaining to service and supply.

Low market price of castor (58.33 per cent), lack of storage facility in rural area (60.00 per cent) and monopoly of private traders in market (54.17 per cent) were major marketing problem, whereas poor contacts of extension workers with farmers (54.17 per cent), non-availability of farm information in time (51.67 per cent) and irregularity of extension workers in rural area (48.33 per cent) were major constraints regarding information transfer.

20. To minimize the constraints in adoption of recommend hybrid castor production technology, majority of the farmers suggested that :

Remunerative market prices of seed castor should be provided to the (91.67per cent), farmers should be protected by crop insurance scheme in case of failure of season (83.33 per cent), minimum support price of castor should be declared well in advance by Government (80.00 per cent), extension system should be streamlined to disseminate farm technology (70.00 per cent), proper technical guidance should be given to the farmers as and when they needs (66.67 per cent), timely supply of canal

water (62.50 per cent), farm information centers should be established at village level (58.33 per cent) ,electricity should be supply regularly (56.67 per cent) ,required farm inputs should be made available at village level (54.17 per cent) and farm consultancy services should be made available to the farmers at village level (50.00 per cent).

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CERTIFICATE - I

Dated: / / 2009

This is to certify that **Desale Maheshkumar Murlidhar** has successfully completed the comprehensive examination of major and supporting subjects on 17/ 04/ 2009 as required under the regulation for M.Sc. in Agriculture.

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CERTIFICATE - II

Dated: / / 2009

This is to certify that the thesis entitled **"EXTENT OF ADOPTION OF HYBRID CASTOR PRODUCTION TECHNOLOGY BY THE FARMERS IN KHEDA DISTRICT OF GUJARAT STATE"** submitted for the degree of **Master of Science** in the subject of **AGRICULTURAL EXTENSION** embodies bonafide research work carried out under my guidance and supervision and that no part of this thesis or research work has been submitted for any other degree. The assistance, guidance and help received during the course of investigation have been fully acknowledged. The draft of the thesis was also approved by advisory committee on 13 /10 /2008.

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This is to certify that the thesis entitled **"EXTENT OF ADOPTION OF HYBRID CASTOR PRODUCTION TECHNOLOGY BY THE FARMERS IN KHEDA DISTRICT OF GUJARAT STATE".** Submitted by **Desale Maheshkumar Murlidhar** to the Anand Agricultural University, Anand in the partial fulfillment of requirement for the degree of **Master of Science** in Agriculture in the subject of **AGRICULTURAL EXTENSION** after suggestion and recommendation by external examiner was discussed and defended by the candidate before the following members of the advisory committee. The performance of the candidate in the oral examination on this thesis has been found satisfactory; we therefore, recommended that the thesis may be approved.

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This is to certify that **Desale Maheshkumar Murlidhar,** Department of **Extension Education, B. A. College of Agriculture**, AAU, Anand has made all correction in the thesis entitled **"EXTENT OF ADOPTION OF HYBRID CASTOR PRODUCTION TECHNOLOGY BY THE FARMERS IN KHEDA DISTRICT OF GUJARAT STATE"** which were suggested by the External Examiner and the advisory committee in the oral examination held on **23/ 11/** 2009.

The final copies of the thesis duly bound and corrected were submitted on / / 2009 are enclosed here with for approval.

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DECLARATION

This is to certify that whole of the research work reported in the thesis in partial fulfillment of the requirement for the award of the degree of **MASTER OF SCIENCE** in Agriculture in the subject of **AGRICULTURAL EXTENSION** is the result of investigation done by undersigned under the direct guidance and supervision of **R. C. Patel,** Associate Professor, Department of Extension Education, B. A. C. A., A.A.U., Anand and no part of the research work has been submitted for any other degree so far.

(Desale Maheshkumar Murlidhar)

Place: Anand
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Place: Anand

Date: /12 /2009 **(**Desale M M**)**

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I. INTRODUCTION

Castor (*Ricinus communis* L.) plant belongs to Euphorbiaceous family. According to available literature, castor is indigenous to Eastern Africa and most probably originated in the Ethiopia. It is also possible that castor is originated in the tropical belt of both India and Africa. Castor is known from very early days in Indian history.

Castor is an important industrial non-edible oilseed crop. Castor seed contains 45-47 per cent non-edible oil, which is used as domestic, medicinal and industrial purpose. Castor oil is used as a lubricant in all moving parts of the machinery and particularly high-speed engines and aeroplanes. Hydrogenated castor oil is used in polished, varnished, transparent paper, linoleum, plasticizers, ointments, waxes, printing ink, cosmetics, hairdressing, soaps etc. In dyeing industries and disinfectants, it is used for the preparation of Turkey red castor oil it also used as purgative. It is used in many veterinary uses. It is also used for medicinal and lighting purposes. It is used externally as emollient and soothing medium when dropped into the eyes of animals after removal of foreign bodies. Oil received from small seeded variety is of very good quality and specially used as a medicine. While oil received from bold seeded variety is used for lightning and lubrication.

Because of its deep root system, drought, hardiness and quick growth, it finds a place of prestige in the cropping systems of

dry land agriculture in semi-arid zones of India. Castor cake is valuable manure of field crops but due to the presence of “Ricin” it is not feed to the cattle. It is useful as a trap crop because root contain ‘ricin’ which kills nematodes entering the roots. It is used as windbreak crop for sugarcane, papaya and banana crops. The plant stalks are used for fuel purpose or for preparing paper pulp.

Castor seed and castor cake are highly poisonous to man and animals because it contains a toxic alkaloid ' ricinine' and' 'ricin'. But the castor cake is a good source of organic manure as it contains 4.5 per cent nitrogen, 1.75 per cent Phosphorus and 1.5 per cent Potash and it also control the white ants and nematodes.

Castor is growing under varied conditions of climate including tropical, sub-tropical and temperate. However, its cultivation is largely confined to the countries lying between 52’ N to 40’S latitude. The major countries growing castor are India, China, Brazil, USSR and Thailand.

India ranks first in respect of area (7.1 lakh hectares), production (8.5 lakh tones) and productivity (1197 kg/ha) in world, about 28 per cent of the world’s acreage and 36 per cent of total output following Brazil. India, occupies the next prestigious market position in the world’s castor market and each year exports substantial part of its total produce to earn foreign exchange.

Total area under Castor crop in India for the year 2007-08 is 748,000 hectares. It has increased by 7% as compared to previous year. Estimated total production of Castor seeds for India

for the year 2007-08 is 910,000 tones. It has increased by 16% as compared to previous year. Average yield for the year 2007-08 is 1216 kg/hectare as against 1123 kg/hectare during the year 2006-07. (Anonymous.2007-08).It has increased by 8% as compared to previous year. Gujarat, Andhra Pradesh, Tamil Nadu, Orissa and Rajasthan are major castor growing states in the country It is also grown in the state of Uttar Pradesh, Maharashtra, Karnataka, Madhya Pradesh and Bihar.

Table: 1 State wise area, yield and production of castor seeds of all India (2007-08).

District	Estimated area Under Crop * ('000 ha.)		Estimated Production *('000 ha.)		Estimated Yield *(Kg/ha.)	
	06-07	07-08	06-07	07-08	06-07	07-08
Gujarat	281.59	354.33	494.81	651.22	1757	1838
Rajasthan	114.90	118.01	135.24	142.88	1177	1211
Andhra Pradesh	248.84	232.56	113.57	83.13	456	357
Other States	52.69	43.50	40.00	32.63	759	750
Total	**698.02**	**748.40**	**783.62**	**909.86**	**1123**	**1216**

* Nielsen India Estimates Source: www.seaofindia.com

The Gujarat state ranks first position in the country with respect to area, production and productivity among all major castor growing states in the country because of adoption of high yielding hybrid varieties grown as irrigated crop. Gujarat

contributes about 4.5 lakh hectares area with an annual production about 6.38 lakh tones of castor seeds. The most important castor growing districts in Gujarat are Mehsana, Sabarkantha, Banaskantha, Kachchh, Amdavad, Kheda, Vadodra, Rajkot, Jamnagar, and Gandhinagar.

Table 2. District wise area, production and yield of castor in Gujarat (2006-07)

Sr.No	Name of district	Area 00 hectare	Production 00 MT	Yield Kg/ha.
1.	Amdavad	128	213	1668
2.	Anand	015	26	1799
3.	Banaskantha	596	925	1552
4.	Bharuch	012	23	1799
5.	Dahod	003	5	1799
6.	Gandhinagar	272	545	2006
7.	Kheda	079	119	1501
8.	Mehsana	353	685	1942
9.	Narmada	009	17	1799
10.	Panchmahal	018	34	1799
11.	Patan	168	204	1213
12.	Sabarkantha	387	539	1394
13.	Surat	004	7	1799
14.	Vadodara	115	151	1308
15.	Amreli	018	32	1799
16.	Bhavnagar	006	10	1799
17.	Jamnagar	097	275	2822
18.	Junagadh	051	91	1799

19.	Kutch	636	1280	2013
20.	Porbandar	009	16	1799
21.	Rajkot	052	164	3164
22.	Surendranagar	243	527	2168
	Total	**3271**	**5888**	**1800**

Source : Directorate of Agriculture, Gandhinagar (2006-07)

Total area under Castor crop in Gujarat for the year 2007-08 was 354,000 hectares. It has increased by 26% as compared to previous year. Area under castor crop has increased in North Gujarat (37%) and Saurashtra (34%). Estimated total production of Castor seeds for Gujarat for the year 2007-08 is 651,000 tones, it has increased by 32% as compared to previous year. the production in all districts has increased as compared to previous year. Average yield for the year 2007-08 is 1838 kg/hectare as against 1757 kg/hectare during the year 2006-07.

Table: 3 Taluka wise area, production and productivity of castor seeds in Kheda district. (2004-05)

No.	**Taluka**	**Area ha**	**Production M.T.**	**Productivity Kg/ha**
1.	Nadiad	66	86	1300
2.	Thasra	1000	1500	1500
3.	Mahudha	276	386	1400
4.	Matar	443	532	1200
5.	Kheda	240	310	1300
6.	Mehmdabad	1147	1600	1400
7.	Kathlal	1500	2250	1500
8.	Kapadvanj	2500	3750	1500
9.	Balashinore	500	650	1300
10.	Virpur	500	650	1300

Total	**8172**	**11030**	**1350**

Source of information: DAO office Zila Panchayat, Nadiad

1.1. Statement of the Problem:

Production of new technology is generally not the major problem now-a-days in our country. The main problem as it exits today is that of diffusion and adoption of new farm technologies among to its ultimate users.

Castor is one of the important non-edible oilseeds cash crop of Kheda district since last ten years because of declination of tobacco cultivation and availability of remunerative market price. Castor is extensively grown in Kapadwanj, Kathlal and Thasara taluka of the district. The area under castor cultivation of the district is 8172 ha hectare, and 11030 tone production having with 1350 kg productivity per hectare. The average yield of the crop is low (1291 kg/ha) as compare to average yield of Research station (i.e., 2230 to 3000 kg/ha) (Annonymous.2005). Recent data of area and production of the district shows that areas under castor cultivation have been increased however the yield is downfall year by year. Therefore, there is a wide gap between the average yield of farmer's field and the potential yield of the crop. This indicates that the farmers might be facing certain problems in castor cultivation. The low yield of hybrid castor could be attributed to the fact that

the farmers have not still adopted all the recommended production technologies of the crop to the desired extent. The knowledge about the recommended practices plays a vital role in adoption. Looking to the importance and urgency of the problem a study entitled **"Extent of Adoption of Hybrid Castor Production Technology by the Farmers in Kheda District of Gujarat State"** was undertaken with the following objectives.

1.2. Objectives of The Study:

1. To know the some selected socio-personal, agro-economic, communicational and psychological characteristics of the farmers.
2. To ascertain the practice wise knowledge level of the farmers about Hybrid Castor Production Technology.
3. To determine the practice wise adoption of Hybrid Castor Production Technology by the farmers
4. To find out the relationship between characteristics of the farmers and their extent of adoption of castor production technology
5. To analyze the constraints experienced by the farmers in adoption of Hybrid Castor Production Technology
6. To seek the suggestions from farmers to overcome the constraints faced by them in adoption of hybrid castor cultivation.

1.3. Importance of the Study:

The findings of the study will be a practical significance in many ways. The study would focus on the personal, social, economic and psychological characteristics of the castor growers. Not only that, it will focus the knowledge level possessed by the castor growers about castor production technology and the crucial factors responsible for the non adoption of recommended castor production technology. These findings may help the extension workers working in Training and Visit system to plan better communication strategies to bridge the technology gap quickly.

The knowledge about personal, social, economic and psychological characteristics of castor growers enables extension workers to envisage and implement the development programme. Future the knowledge about behavioural aspects such as knowledge and adoption levels of the farmers may help to predict the success and failure of the innovative project in transfer of castor production technology among the castor growers.

The investigation would also identify the constraints experienced by the castor growers in adopting recommended castor production technology. Such knowledge would serve as guideline to scientists of the Anand Agricultural University in modifying future plan of research in castor crop and also to input supply agencies to improve their efficiency in supply and services.

In short the study will be most useful in formulating and modifying extension efforts and planning for better use of

resources. The findings of the study will assist to the planners, administrators and inputs supplying agencies to help the farmers in obtaining sustainable higher yield per unit area.

1.4 Assumptions of the study

The present study was based on following assumptions

1 All the farmers in study area had an equal opportunity to derive the benefits of services provided by various agencies specially related to agriculture and rural development.

2 The recommended practices of castor cultivation were technically sound, economically feasible, educationally attainable and culturally compatible to the farmers of the area under study.

3. A study of this nature can be done through personal and group interview techniques.

1.5. Limitations of the study:

On account of limited time and resources available with the investigator, the present study was undertaken with the following limitations:

1. The area of the study was limited to only few villages of Kapadwanj taluka of Kheda District.
2. Only one hundred and twenty farmers were selected randomly from the selected villages for the study.

3. In the profile of the farmers, few selective characteristics of farmers were studied.
4. The study was based on oral responses received from the castor growers.
5. The study was limited to certain aspects concerning adoption process of the castor growers.

The findings of this study may not be applicable to the same extent to other areas of the State.

II. REVIEW OF LITERATURE

The main purpose of this chapter is to organize and present the finding of the research studies, which are related to the future investigation. In accordance with the objective of the study, a brief account of related literature has been reviewed and presented in this chapter under the following heads:

2.1 Characteristics of the farmers.

2.2 Practice wise Knowledge level of the farmers about recommended hybrid castor production technology.

2.3 Practice wise Extent of adoption of recommended hybrid castor production technology by the farmers.

2.4 Relationship between characteristics of the farmers and their extent of adoption of recommended castor production technology.

2.5 Constraints experienced by the farmers in adoption of recommended hybrid castor production technology.

2.6 Suggestions offered by the farmers to overcome the constraints in adoption of recommended hybrid castor cultivation.

2.1 Characteristics of the farmers:

1. Age

Prajapati (2005) indicated that (45.5 per cent) of the castor growing farmers were from middle age group followed by young age group 28.5 per cent and old age group 26.0 per cent.

Jaloriya (2006) reported that majority of the green gram growers were found in middle age group followed by young age group (27.5 per cent) and old age group (13.33 per cent).

Kumar *et al.* (2008) stated that majority (64.29 per cent) of the paddy growers were belongs to medium age (36 -50 years).

2. Education

Varma (2000) indicated that 67.19 per cent of the groundnut growers had primary level and secondary level of education.

Parmar (2006) reported that slightly more than two fifth (43.34 per cent) of the paddy growers were educated up to primary level, whereas slightly less than one third (30.00 per cent) of them possessed education up to secondary and higher secondary level of education.

Kumar *et al.* (2008) stated that more than half (53.35 per cent) of the paddy growers were educated up to secondary to higher secondary level of education.

3. Farming Experience

Parmar (2006) indicated that majority (85.00 per cent) of the paddy growers had medium level of experience in cultivation of paddy crop.

4. Social participation

Jaloriya (2006) reported that majority (55.00 per cent) of the gram growers had membership in one organization. Whereas, nearly one fourth (25.17 per cent) had membership in more than one organization.

Prajapati (2005) concluded that majority (70.00 per cent) of the castor growing farmers were associated with one social organization whereas 6.50 per cent were member in more than one organization.

Kumar *et al.* (2008) stated that more than half (55.71 per cent) of the paddy growers had medium level of participation in various social organizations

5. Occupation

Patel (2000) concluded that, more than half (50.70 per cent) of the beneficiary farmers had farming and animal husbandry occupation as a source of income, whereas more than one third (34.50 per cent) of the beneficiary farmers were dependent on farming along with animal husbandry and farm labouring for main stay of their life in watershed area.

Parmar (2006) indicated that, majority (58.33 per cent) of the paddy growers were dependent on farming and animal husbandry, for their lively hood followed by farming along with animal husbandry and farm labouring (25.00 percent) and farming only (16.67 per cent).

Kumar *et al.* (2008) concluded that majority (60.95 per cent) of the paddy growers engaged exclusively in agricultural occupation, while 20.45 per cent of the respondent paddy growers followed agriculture along with allied occupations.

6. Land holding

Patel (2000) found that, half (48.39 per cent) of the beneficiary farmers were having small size of land holding, were as little more than one forth (25.34 per cent) and slight more than one fifth (20.74 per cent) of the beneficiary farmers were having marginal and medium size of land holding respectively.

Prajapati (2005) reported that (42.00 per cent) of the castor grower possessed large size of land holding Where as 37.50 per cent of them had medium size of land holding (2.0 - 4.0ha.)

Kumar *et al.* (2008) reported that majority (59.09 per cent) of the paddy growers possessed medium (1.01 - 3.45 ha.) Size of land holding followed by small and big size of land holding respectively.

7. Possession of Animals

Patel *et al.* (2003) observed that, majority (60.0 per cent) of the hybrid tobacco growers possessed up to two milch animals whereas, nearly one fourth (24.0 per cent) of them had three to four milch animals.

Parmar (2006) concluded that, slightly more than two third (66.67 per cent) of the paddy growers had up to 2 milch animal, whereas, 10.00 per cent of them had more than 2 animals.

8. Sources of Information

Prajapati (2005) observed that village extension worker (93.00) per cent was the most utilized sources of information for hybrid castor growers followed by radio, neighbour and progressive farmers.

Parmar (2006) indicated that, more than three fourth (78.34 per cent) of the paddy growers had medium level of utilization of information sources followed by low 15.83 per cent and high 5.83 per cent level of utilization of information sources. Village Extension Worker (75 per cent), agro service center (73.33 per cent), progressive farmer (70.83 percent) and newspaper (66.66 per cent) were the major sources of information for paddy growers in study area.

Singh (2007) indicated that more than half (54.16 per cent) of the tobacco growers utilized various information sources at medium level, followed by high (25.00 per cent) and low (20.83 per cent) level of utilization of information sources.

9. Extension Contact

Jaloriya (2006) reported that about (59.17 per cent) of the green gram growers had medium level of extension contacts followed by high 21.66 pre cent and low 19.17 per cent.

Singh (2007) indicated that majority (65.00 per cent) of the tobacco growers had medium level of contacts with different extension agencies followed by high 18.33 per cent and low 16.66 per cent extension contact.

10. Extension participation

Patel (2000) reported that majority of the beneficiary farmers (53.00 per cent) in water shed area had medium level of extension participation followed by low level 32.25 per cent and high level 14.75 per cent of extension participation, respectively.

Parmar (2006) indicated that less than three forth (58.33 per cent) of the paddy growers had medium level of extension participation followed by 34.17 per cent and 7.50 per cent of them had high and low level of extension participation in extension activities respectively.

11. Scientific orientation

Prajapati (2005) reported that more than half (52.00 per cent) of the hybrid castor growers had medium level of scientific orientation; where as 31.50 per cent and 16.50 per cent of them had high and low level of scientific orientation respectively.

12. Economic motivation

Prakash *et al.,* (2003) indicated that majority (67.00 per cent) of the rice growers were having medium level of economic motivation, where as one fourth (25.00 per cent) of them had low level of economic motivation.

Prajapati (2005) reported that nearly three fourth (72.50 per cent) of the hybrid castor growers had medium level of economic motivation; where as 15.00 per cent and 12.50 per cent of them had low and high level of economic motivation.

13. Risk orientation

Prajapati (2005) reported that slight more than half (52.00 per cent) of the hybrid castor growers had medium level of risk orientation; where as 39.00 per cent and 9.00 per cent of them had low and high level of risk orientation.

Kumar *et al.* (2008) stated that a majority (70.00 per cent) of the paddy growers had medium level of risk orientation while 16.19 per cent of them had low risk orientation.

14. Knowledge

Anonymous (1998-99) reported that majority (67.50 per cent) of the castor growers had medium level of knowledge about recommended hybrid castor cultivation technology.

Prajapati (2005) reported that majority (63.00 per cent) of the respondents were having medium level of knowledge; where as 19.00 per cent and 18.00 per cent of them had low and high level of knowledge regarding recommended hybrid castor cultivation technology.

2.2. Knowledge level of the farmers about recommended crop production technology

Anonymous (1998-99) reported that majority (67.50 per cent) of the castor growers had medium level of knowledge about recommended hybrid castor cultivation technology.

It is also observed that majority of the farmers possessed good knowledge about the technology namely sowing method (99.16 percent), seed rate (97.00 per cent), time of sowing (99.66 per cent), weeding (93.75 per cent), spacing (85.33 per cent), Selection of variety (77.91 per cent), FYM application (73.75 per cent), irrigation (69.16 per cent) and intercultural operation (65.00 per cent) whereas, very poor knowledge was observed in gypsum application, chemical weed control, soil testing, pest and diseases control.

Prajapati (2005) concluded that majority (63.00 per cent) of the castor growers had medium level of knowledge about recommended hybrid castor cultivation technology.

Parmar (2006) found that majority (60.00 per cent) of the paddy growers had medium level of knowledge followed by 26.67 per cent and 13.33 per cent of them had high and low level of knowledge in relation to recommended paddy production technology

Majority of the paddy growers possessed high level of knowledge about paddy production technology viz., improved varieties (100.00 per cent), manual weed control (95.83 per cent), time of transplanting (79.16 per cent) and proper time of harvesting (75.00 per cent). It is also interested to note that farmers had very

poor knowledge about seed treatment (12.50 per cent), chemical weed control (16.66 per cent) and disease control (20.83 per cent).

2.3. Extent of Adoption of recommended crop production Technology by the farmers

Anonymous (1998-99) reported that majority (74.58 per cent) of the castor growers had moderately adopted recommended castor production technology.

Majority of them had adopted technologies namely; method of sowing (99.16 per cent), weeding (88.33 per cent), time of sowing (84.16 per cent)), seed rate (78.33 per cent), improved variety (77.91per cent), FYM application (74.50 per cent) and proper sowing distance (70.00 percent) respectively. Whereas, poor adoption was recorded in Gypsum application, cake application, soil testing, disease and pest control and application.

Sachan and Sharma (2004) revealed that overall 50.00 per cent of mustard growing farmers were found to be in medium adoption group followed by low (28.00 per cent) and high (22.00 per cent adoption group.

It was also reported that overall majority of mustard growers had adopted time of sowing (66.00 per cent) weeding (61.33 per cent), Irrigation (68.66 per cent) as per recommendations.

Over adoption was observed in the cases of preparatory tillage (86.00 per cent), seed rate (85.66 per cent). Majority (88.66 per cent) farmers used untreated seeds, while; majority (59.00 per

cent) farmers did not used plant protection measures against pest and diseases.

Prajapati (2005) reported that majority (63.00 per cent) of the castor growers were having medium level of adoption. It was also observed that hybrid castor growers had adopted recommended cultivation practices viz; Thrashing (95.00 per cent), Irrigation (94.00 per cent), interculturing (90.00 per cent), harvesting and picking (89.00 per cent), improved variety (88.00 per cent), timely sowing (82.00 per cent), weeding (77.00 per cent), chemical fertilizers (58.00 per cent). Poor adoption was observed in case of diseases control (06.00 per cent), seed treatment (08.00 per cent), and pest control measures (18.00percent) and recommended spacing (43.00 per cent) respectively.

Singh *et al.* (2006) reveals that majority (66.87 per cent) of the farmers belonged to medium adoption category followed by high (15.53 per cent) and low (17.50 per cent) adoption categories with respect to recommended mustard cultivation technology.

Singh and Dangi (2007) indicated that majority (70.00 per cent) of the cotton growers fell in the medium adoption group, whereas remaining 30.00 per cent of them were distributed equally in low and high adoption group. So far adoption of cotton production technology is concerned majority of the farmers adopted technologies namely, field preparation (75.00 per cent), irrigation management (71.88 per cent),time and method of sowing (66.39 per cent), high yielding varieties (59.72 per cent), seed rate and

recommended spacing (56.67 per cent), manure and fertilizer application (56.67 per cent) and plant protection measures (54.83 per cent) respectively.

2.4 Relationship between characteristics of farmers and Extent of adoption of crop production technology

1. Age and Adoption

Anonymous (1998-1999) indicated that there was positive and significant correlation between age of the farmers with adoption level of castor production technology.

Prajapati (2005) concluded that there was negative and significant relationship between age of the farmers and extent of adoption of castor production technology.

2. Education and Adoption

Anonymous (1998-1999) indicated educational level of the farmers had shown positive and significant correlation with adoption level of castor production technology.

Kawale (2000) found that education of the farmers had positive and significant relationship with adoption of mustard production technology.

Prajapati (2005) concluded that there was positive and significant relationship between educational level of the farmers and extent of adoption of hybrid castor production technology.

3. Farming experience and Adoption

Puthira and Punnuswamy (2006) indicated that, farming experience of the farmer was positively and significantly correlated with adoption of recommended mungbean production practices.

Singh (2007) concluded that farming experience of the tobacco growers was found significant correlation with their extent of adoption of recommended tobacco production technology.

4. Social participation and Adoption

Mundhawa and Patel (2000) reported that social participation of the farmers in various organizations had non significant relationship with adoption of rainfed wheat cultivation.

Joshi (2004) indicated that social participation of the cotton growers was not significantly associated with adoption of modern practices in cotton.

Prajapati (2005) noted that social participation and extent of adoption castor production technology were positively and significantly correlated to each other.

Patel (2006) reported that social participation had positive and non significant correlation with adoption of recommended integrated pest management technology in pigeon pea growers.

5. Occupation and Adoption

Prakash *et al.* (2003) reported that occupation had shown no significant relationship with extent of adoption of rice production technology.

Parmar (2006) found that occupations of the paddy growers and their adoption of paddy production technology had shown positive and significant correlation.

Singh (2007) concluded that occupation of the tobacco growers and their extent of adoption of recommended tobacco production technology had no significant correlation.

6. Land holding and Adoption

Kawale (2000) indicated that land holding of the farmers had non- significant relationship with extent of adoption of mustard production technology.

Prajapati (2005) revealed that there was significant relationship between land holding of farmers and their extent of adoption of castor production technology.

7. Possession of Animals and Adoption

Patel (2000) reported that herd size of beneficial farmers and their adoption of watershed management technology were significantly associated in watershed area.

Parmer (2006) found that there was positive and significant relationship between milch animals possessed by the farmers and their extent of adoption of paddy production technology.

8. Sources of Information and Adoption

Prajapati (2005) observed that sources of information and extent and adoption of hybrid castor production technology did not show any relationship among each other.

Parmar (2006) concluded that, sources of information of the paddy growers had positive and significant correlation with their extent of adoption of recommended paddy production technology.

Singh (2007) concluded that various sources of information utilized by the tobacco growers had positive and significant correlation with their extent of adoption of recommended tobacco production technology.

9. Extension Contact and Adoption

Patel (2005) found that extension contact of the chilli growers had positive and significant correlation with adoption level of recommended chilli cultivation technology.

Zala (2008) revealed that extension contact of cotton growers was significantly and positively associated with their adoption of crisis management practices in cotton cultivation.

10. Extension participation and Adoption

Verma and Munshi (2000) found that adoption of groundnut production technology had shown non-significant relationship with extension participation of the farmers.

Parmar (2006) found that participation of the farmers in various extension activities had shown positive and significant influence on adoption of paddy production technology.

11. Scientific Orientation and Adoption

Prajapati (2005) found that scientific orientation of castor growers had positive and significant relationship with adoption of hybrid castor production technology.

Patel (2006) indicated that scientific orientation of the pigeon pea growers had positive and significant correlation with the adoption of recommended integrated pest management technology in pigeon pea by the pigeon pea growers.

12. Economic motivation and Adoption

Prajapati (2005) observed that positive and significant relationship was observed between economic motivation of the hybrid castor growers and their extent of adoption of hybrid castor production technology.

13. Risk orientation and Adoption

Verma and Munshi (2000) reported that risk preference was not significantly correlated with the adoption of groundnut production technology.

Prajapati (2005) observed that there was positive and significant relationship between risk orientation and extent of adoption of hybrid castor production technology.

Singh (2006) found that there was no significant relationship between risk orientation of the farmers with adoption gap in sesame production technology.

14. Knowledge and Adoption

Verma and Munshi (2000) reported that knowledge was significantly associated with extent of adoption of groundnut production technology.

Prajapati (2005) concluded that there was positive and significant relationship between knowledge level of the castor growers and their extent of adoption of hybrid castor production technology.

2.4. Constraints experienced by the farmers in adoption of farm Technology

Joshi (2004) concluded that non availability of irrigation facilities including salty under ground water and shortage of rainfall, shortage of FYM, risky and production of market price, poor social and economic conditions, high price and shortage of inputs, shortage of labours and its high rate were the major constraints faced by the cotton growers in adoption of modern practices of cotton cultivation.

Prajapati (2005) concluded that irregular rainfall, irregular supply of electricity, lack of technical guidance, high charges of electricity, high production cost, high cost of fertilizers and high lab our charges were major constraints as perceived by the farmers in adoption of hybrid castor production technology.

Kumar *et al.* (2008) Uncertain contact of extension workers (82.85 per cent), high chares of farm labours (81.43 per cent), shortage of labours during season, lack of knowledge about plant protection measures (75.25 per cent), high cost of chemical fertilizers (71.90 per cent), lack of knowledge about seed and seedling treatment (71.00 per cent) were major constraints in adoption of paddy cultivation practices

2.6. Suggestions offered by the farmers to overcome constraints in adoption of recommended farm technology

Mundhwa and Patel (2000) revealed that farmer's suggestions to overcome the constraints in adoption of rain fed wheat production technology were need to evolve high yielding variety, improved seed shown to be made available and need of frequent visits to VLWs.

Parmar (2006) observed that farmers should be protected by crop insurance scheme in case of failure of season followed by remunerative market prices of agricultural production should be provided to the farmers, farm inputs should be provided on subsidized rate to marginal and small farmers, timely supply of canal water, proper technical guidance should be given to the

farmers as and when they needs, farm inputs should be made available at village level, training on new cultivation technology should be imparted and extension system should streamlined to disseminate farm technology.

Prajapati (2005) indicated provision of technical guidance in time, regular supply of electricity for irrigation, provision of remunerative price to the produce were the major suggestions as offered by the farmers to overcome the constraints in adoption of hybrid castor production technology.

III. RESEARCH METHODOLOGY

This chapter deals with the description of methods and procedure followed in the various phases of the study and they are discussed in details under following heads:

3.1 PLAN OF STUDY

Castor is one of the important non- edible oilseeds cash crops of Kheda district since last ten years because of declination of tobacco cultivation and availability of remunerative market price. Castor is extensively grown in Kapadvanj, Kathlal and Thasara talukas of the district. The area under castor cultivation of the district is 8172 ha hectare, and 11030 tone production having with 1350 kg productivity per hectare.

Oilseeds Research Station (Castor) of Sardarkrushinagar Dantiwada Agricultural University had developed high yielding hybrid castor varieties and recommended crop production technology for farming community of the state. These recommendations are disseminated through various transfer of technology centers like Sardar Smruti Kendra, Farm Advisory Unit, KrushiVigyan Kendra, Agricultural Technology Information Centre (ATIC) of Anand Agricultural University, Anand and Field Extension functionary, Farmers Training Centre of State Department of Agricultural and NGOs to farming community for adoption

Development of new technology is generally not the major problem now-a-days in our country. The main problem as it exits today is that of diffusion and adoption of new farm technologies among to its ultimate users. Therefore, it is quite necessary to focus the light on level of knowledge and extent of adoption of recommended hybrid castor production technology and difficulties experienced by the farmers in adoption of these technologies.

Looking to the importance and urgency of the problem, a study entitled “Extent of adoption of Hybrid Castor Production Technology by the Farmers in Kheda District of Gujarat State".

The research problem was discussed with major advisor, members of advisory committee and different experts in the field. It was considered that study of this nature would be useful to planners, administrators and extension functionaries in modifying and restructuring research and extension strategy effectively.

3.2 AREA OF STUDY

The present investigation was conducted in Kheda district of Gujarat state, which is located at an elevation of 45.1 meters above the mean sea level and is situated at 22.30^0 to 23.18^0 North latitude and 72.32^0 to 73.37^0 East longitude in the middle part of the Gujarat state. The eastern boundary of the district touches Amdavad and Gandhinagar, Western boundary touches Panchmahals, Northern boundary touches Sabarkantha while Southern boundary touches Vadodara districts.

The Kheda district comes under in Middle Gujarat Agro-climatic zone of the state. Climate of the district is semi-arid and sub-tropical type. Winter is mild, cool and dry while summer is quite hot and dry. October to May sunny months generally receiving on an average eight hours of sunshine per day. An average annual temperature for this region ranges from 36.7 c to 46.7 c and May is the hottest month. Winter sets in middle of the October and continuous till the middle of February. Monsoon is often erratic and uncertain both in total rainfall and its distribution. Average rain fall of the district is 750 mm to 950 mm.

Physiographically entire region is uniformly flat. The soil of Kheda district is sandy loam fertile soil, locally known as “Goradu” soil. Total land of Kheda district is about 394388 ha; and out of which 304669 ha is under cultivation. Among this cultivated area, 97096 ha area is sown more than once. As per Census of 2001, total population of district is 2023354 and overall literacy

level is 72.71 per cent. While Kapadvanj taluka is spread over 621.52 sq. km. area with total population around 204474 and literacy level 73.48 per cent.

Majority of the population engaged in agriculture as a major occupation. Cotton, castor, tobacco, bajra, maize, wheat, potato, mustard and rice are the major crops grown by the farmers in study area. AMUL also played a significant role in increasing the average income of the farmers, because Kheda districts Co-operative Milk Marketing Union (AMUL) have developed co-operative structure. Majority of the farmers have adopted animal husbandry as secondary occupation along with farming for economic support.

3.3 RESEARCH DESIGN

This study was concerned with identifying the some selective characteristics of farmers that influence their adoption of recommended hybrid castor production technology. Ex – post facto design was applied for this study. Kerlinger (1976) stated that ex-post facto design is worthy to apply when the independent variable has already acted upon.

3.4 SAMPLING TECHNIQUES

For the present investigation, simple random sampling technique was employed.

3.4.1 Selection of villages

Present study was conducted in Kapadwanj taluka of Kheda district because it has maximum area under cultivation of

hybrid castor than the other taluka of district. On the basis of area under hybrid castor cultivation, a list of villages was obtained from the Sub Division office of T & V system and from these 10 villages was selected randomly.

3.4.2 Selection of respondents

A proportionate random sampling technique was followed for selection of respondents of each selected village. A list of the farmers of each selected village was obtained from the record of gram panchayat of respective village. There after 10 per cent farmers of each village were selected randomly in such a manner that there would be proportional to total size of farmers in respective selected villages. Village distribution with total farm families and respondents selected for study is given in Table 4.

Table. 4: List of selected villages and respondents

Sr. no	Name of villages	No of respondents
1	Telnar	17
2	Chikhlod	13
3	Kaladinamuwada	10
4	Navagam	09
5	Vyas Vasna	13
6	Dana	13
7	Ambaliyara	15
8	Sonipura	10
9	Kashipura	12
10	Karkariya	08
Total		**120**

3.5 SELECTION OF VARIABLES

The selection of variables included in the study was done on the basis of extensive review of literature related to the subject in consultation with the experts and from previous study conducted in the related subject. Finally the variables that were found to be most relevant to the present study were selected for the study. A list of selected dependent and independent variables is as under:

3.5.1. Independent variables

I. Socio personal Variables:

1. Age
2. Education
3. Farming experience
4. Social participation

II. Agro-Economical Variables:

5. Occupation
6. Landholding
7. Animal possession

III. Communicational Variables:

8. Sources of information
9. Extension contact

10. Extension participation

IV. Psychological Variables:

11. Scientific orientation
12. Economic motivation
13. Risk orientation
14. Knowledge

3.5.2 Dependent Variables

1. Adoption of recommended hybrid castor production technology.

Variables along with technique used for their measurement

Sr. No.	Name of the Variables	Measurement Technique
A.	Independent variables	
1.	Age	Chronological age of the respondents.
2.	Education	Structured schedule was developed.
3.	Experience of castor growers	No. of years of experience.
4.	Social participation	SES scale developed by Pareek and Trivedi (1963) was used with some modifications.
5.	Occupation	SES scale developed by Pareek and

		Trivedi (1963) was used with some modifications.
6.	Land holding	SES scale developed by Pareek and Trivedi (1963) was used with some modifications.
7.	Animal possession	SES scale developed by Pareek and Trivedi (1963) was used with some modifications.
8.	Sources of information	Structured schedule was developed.
9.	Extension contact	Structured schedule was used.
10.	Extension participation	Structured schedule was developed.
11.	Scientific orientation	Scale developed by Supe (1969) was used with some modifications.
12.	Economic motivation	Scale developed by Supe (1969) was used with some modifications.
13.	Risk orientation	Scale developed by Supe (1969) was used with some modifications.
14.	Knowledge	Structured schedule was developed.
B.	**Dependent variable**	
	Adoption of recommended production technology of castor.	Scale developed by chattopadhyay (1974) was used with some modifications.

3.6 OPERATIONALIZATION AND MEASUREMENT OF VARIABLES

The measurement of techniques for each of the selected dependent as well as independent variables is presented below.

3.6.1 Operationalization and measurement of independent variables

3.6.1.1. Age

Age of the farmers was operationalized as the number of completed years of the respondents at the time of interview. The respondents were classified into three categories as under:

Sr. No	Category
1	Young age group (up to 35 years)
2	Middle age group (between 36 to 50 years)
3	Old age group (above 50 years)

3.6.1.2 Education

It refers to the number of years of formal education completed by the respondent farmers. The respondents were classified into four groups,

Sr. No.	Educational level
1	Illiterate
2	Primary (up to 7^{th} standard)
3	Secondary and Higher Secondary (8^{th} to 12^{th} standard)
4	Above Higher Secondary (above 12^{th} standard)

3.6.1.3. Farming experience

It refers to the chronological experience of respondent farmers possessed in cultivation of castor crop. On the basis of minimum and maximum experience, respondents were categorized into three groups.

Sr. No	Category
1	Low experience (up to 5 years)
2	Medium experience (6 to 10 years)
3	High experience (above 10 years)

3.6.1.4. Social participation

Information regarding membership of castor growers in formal organizations was collected and quantified on the basis of scoring system followed by Pareek and Trivedi (1963) with some modification as under:

Sr. No.	Social participation	Score
1	No membership	0
2	Membership in one organization	1
3	Member in more than one organizations	2
4	Office bearers.	3

3.6.1.5. Occupation

Occupation referred as involvement of respondent in different income generating activities for livelihood and prosperity of his family. For this purpose information, regarding occupations of the respondents was collected in which they were directly or indirectly associated for income generation. On the basis of frequency distribution of each occupation, they were classified, and respondents were categorized into three groups.

Sr. No.	Social participation	Score
1	Farming only	1
2	Farming along with animal husbandry	2
3	Farming along with animal husbandry and farm labouring	3

3.6.1.6. Land holding

It refers as total land owned by individual respondent for the purpose of obtaining agricultural production. This is an important situational factor that determines socio-economic status and potentiality of farmers for adoption of new farm technologies.

It was measured by actual number of hectares of land owned and cultivated by the farmers. On the basis of actual land holding possessed, they were classified into four groups

Sr. No.	Category	Land possessed	Score
1	Marginal	< 1.00 ha	1
2	Small	1.01 to 2.00 ha	2
3	Medium	2.01 to 4.00 ha	3
4	Large	More than 4.01 ha	4

3.6.1.7 Animal possession

Animal possession of the farmer is one of the important factors that determine the socio- economic condition of the farmers. One score was assigned to each animal to calculate the total animals of each respondent. Keeping this in view, information regarding total animal possessed by the respondents was collected and distributed into three groups (1) No animal (2) up to 2 animals (3) more than 2 animals.

3.6.1.8 Sources of information

Sources of information play major role in diffusion and adoption of farm innovation. Sources of information are conceptualized as the sources through which farmers get information about new idea or method of farming. All kind of informal, formal and mass media sources were considered as possible available sources to the farmers. One score was assigned to each source to calculate the total sources of each respondent. Respondents were asked to indicate the different sources used for

farm information. Total sources of information score for each respondent was calculated by summing of actual score he received on the basis of mean and S.D. They were categorized in three groups,

Sr. No.	Category	Score range
1	Low sources of information	Less than X – S.D.
2	Medium sources of information	Between X $\pm$ S.D.
3	High sources of information	Above X + S.D.

3.6.1.9 Extension contact

Extension contact of the hybrid castor growers was measured considering the frequency of contact with the different extension personals and agencies viz; Village Level Worker, Agriculture Extension Officer, Subject Matter Specialist, Sub-Divisional Agricultural Officer, Scientist of Agricultural University, K.V.K., S.S.K. and other. The score was assigned as under:

Sr. No.	Extension contact	Score
1	Regularly	4
2	Frequently	3
3	Occasionally	2
4	Never	1

The pooled score expressed the degree of contact of the farmers with the extension agency. On the basis of mean and standard deviation, the respondents were categorised in to following three groups.

Sr. No.	Extension contact	Score range
1	Low extension contact	Less than Mean – S.D.

2	Medium extension contact	Between Mean ± S.D.
3	High extension contact	Above Mean + S.D.

3.6.1.10 Extension participation

Extension participation refers as the degree of active involvement of the farmers in various formal and non formal educational/extension activities including individual contact, group contact and mass contact methods with a view of obtain information, knowledge and skill related to agriculture and allied fields.

A list of 10 different extension activities in which farmers generally participate was prepared from available literature and assigned one score to each activity to assess the extension participation. The level of extension participation of individual respondent was calculated by summing up actual scores he received. Mean and standard deviation was calculated and finally respondent were classified in three groups.

Sr. No.	Extension participation	Score range
1	Low extension participation	Less than Mean – S.D.
2	Medium extension participation	Between Mean ± S.D.
3	High extension participation	Above Mean + S.D.

3.6.1.11 Scientific orientation

Scientific orientation of the hybrid castor growers was measured with the help of scale developed by Supe (1969) with due modification.

The responses of the respondents were obtained against each item in terms of their agreement or disagreement with statement. The positive and negative statements were scored as follows.

Statement	**Strongly agree**	**Agree**	**Undecided**	**Disagree**	**Strongly disagree**
Positive	5	4	3	2	1
Negative	1	2	3	4	5

The respondents were classified into three categories on the basis of mean and standard deviation.

Sr. No.	**Categories**	**Score range**
1	Low scientific orientation	< Mean – S.D.
2	Medium scientific orientation	Between Mean $\pm$ S.D.
3	High scientific orientation	> Mean + S.D.

3.6.1.12 Economic motivation

Economic motivation of the hybrid castor growers was measured with the help of scale developed by Supe (1969) with due modification.

The responses of respondents were obtained against each item in term of their agreement or disagreement with statement of five point continuum ranging from strongly agree to strongly disagree. The positive and negative statements were scored as follows:

Statement	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Positive	5	4	3	2	1
Negative	1	2	3	4	5

Economic motivation score of an individual respondent was the sum total of score of all statements included in the scale. Categories formed on the basis of mean and standard deviation are as under:

Sr. No.	Category	Score range
1	Low economic motivation	< Mean – S.D.
2	Medium economic motivation	Between Mean $\pm$ S.D.
3	High economic motivation	> Mean + S.D.

3.6.1.13 Risk orientation

Risk bearing capacity of the hybrid castor growers was measured with the help of scale developed by Supe (1969) with due modification.

The scale consists of six statements. The responses from the respondents were obtained against each items of their degree of agreement or disagreement. The positive and negative statements were scored as follow.

Statement	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Positive	5	4	3	2	1
Negative	1	2	3	4	5

The respondents were classified into three categories on the basis of mean and standard deviation.

Sr. No.	Categories	Score range
1	Low risk orientation	< Mean – S.D.
2	Medium risk orientation	Between Mean $\pm$ S.D.
3	High risk orientation	> Mean + S.D.

3.6.1.12 Knowledge

Knowledge is defined as body of understood information possessed by an individual. In this study knowledge is conceptualized as "body of understood information possessed by castor growers about recommended practices of hybrid castor cultivation".

To measures the knowledge level of the respondents about recommended hybrid castor production technology, a teacher made scale was used.

The test consists of **28** items concerning hybrid castor production technology. Respondents were asked to answer correct or incorrect and yes or no. They were asked to answer some direct questions. The correct answers were tick marked and assigned one score. The total number of tick marked items was the knowledge score of the individual respondent about the test. Following formula was used for calculating the knowledge index of individual respondents.

$$X_1 + X_2 \ldots\ldots + X_n$$

$$K_i = \frac{X_1 + X_2 \ldots\ldots + X_n}{N} \times 100$$

Where,

K_i = Knowledge index

$X_1 + X_2 \ldots\ldots + X_n$ = Total number of correct answer

N = Total number of items / questions

On the basis of knowledge index, respondents were stratified in following three groups such as follow:

Sr. No.	Level of knowledge	Score range
1	Low	< Mean – S.D.
2	Medium	Between Mean $\pm$ S.D.
3	High	> Mean + S.D.

3.6.2.2 Adoption of hybrid castor production technology.

Rogers (1962) stated that adoption is a decision to continue full use of an innovation. The adoption process is a mental process through which an individual passes from first hearing about an innovation to its final adoption. In this study the adoption is defined as "actual use of hybrid castor production technology by the farmers" as recommended by Anand Agricultural University.

In the present study an attempt was made to develop an adoption index, which can scientifically measure the extent of adoption of hybrid castor production technology by the farmers of Kapadvanj taluka.

On the basis of literature reviewed and personal discussion with extension personnel and experts, **11** (Eleven) hybrid castor production technologies were finalized as possible components of extent of adoption.

These selected practices were circulated among 10 experts who have minimum five year experience in the field of research. Keeping in mind the importance of particular technology, they were asked to distribute 100 scores among selected eleven technologies. The weightage of the particular technology assigned by each expert was summed up and arithmetic mean was calculated and rounded of to nearest integral figure. Thus the technology wise weightage of adoption is indicated as under:

Practice-wise weightage of hybrid castor production technologies

Sr. No.	Adoption	Weightage
1.	Land preparation	10
2.	Improve varieties	20
3.	Time of sowing	10
4.	Method of sowing	05
5.	Spacing	05
6	Seed rate kg/ha.	04
7	Organic manure	08
8	Chemical fertilizer	10
9	Irrigation management	10
10	Weed management	
	1. Manual weed control	05
	2. Chemical weed control	03
11	Plant protection	
	1. Pest control	06

	2. Disease control	04
	Total	**100**

Respondent's general adoption level was determined by Adoption Quotient (AQ) developed by Chattopadhyay (1974)

$$A.Q. = \frac{\sum \frac{e_1}{p_1} w_1 + \sum \frac{e_2}{p_2} w_2 + \cdots + \sum \frac{e_n}{p_n} w_n}{W \times N} \times 100$$

Where,

A.Q. = Adoption quotient

$\sum$ = Summation

$e_1 e_2 \ldots e_n$ = extent of adoption in terms of score obtained by farmer for the particular practice.

The total score obtained by each individual was worked out and summed up on the basis of mean and standard deviation (S.D.). The respondents were grouped into three categories

Sr. No.	Category	Score range
1	Low adoption	< Mean – S.D.
2	Medium adoption	Between Mean $\pm$ S.D.
3	High adoption	> Mean + S.D.

3.7 METHOD OF DATA COLLECTION

Basic method used for data collection was a field survey. Interview schedule was used as tool for collection of requisite information.

To cover all aspects in light of the objectives of the study, an interview schedule with questions on all dependent and independent variables was prepared in a vernacular language for collection of data. There after, it was pre tested on separate 25 non sample respondents. On the basis of pre-testing, necessary modifications were made in the final draft and used as a tool for data collection. Before the interview, the investigator has introduced him self to the respondents and aims and objectives of the study were explained to them with a view to facilitate free responses. The questions from the schedule were asked one by one and their responses were recorded in schedule it self. Every possible care was taken to maintain congenial atmosphere to secure unbiased and reliable information from the respondents. The respondents were contacted personally either at their work spot or at their residents during months of November – December 2008.

Basic information regarding the study was obtained from the records of the gram panchayat of the respective villages, taluka panchayat of Khambhat and from the office of Deputy Director Of Agricultural (extension), Anand. Whereas, secondary data and other relevant information for the study was gathered from the reference book, research journals, magazines and bulletins

published by different organizations and post-graduate theses pertaining to similar study.

3.8 ANALYSIS OF DATA

The data collected through interview schedule were on the measurement. They were coded, processed, tabulated, classified and analyzed in light of the objectives of the study. The hypotheses formulated were tested and salient information was drawn in order to make the findings meaningful.

The following statistical techniques were applied for analysis of data.

3.8.1 Percentage

Simple interpretation and comparisons were made on the basis of percentage.

3.8.2 Arithmetic Mean and Standard Deviation

The techniques were used for classification of the respondents into different categories:

(1) The mean was obtained by dividing total score by the number of respondents.

(2) The standard deviation worked out from the total score obtained by each respondent by using the following formula:

$$S.D. = \sqrt{\frac{\Sigma (Xi - \bar{X})^2}{n-1}}$$

Where,

S.D = Standard deviation

Σ = Sum

Xi = Individual score

$\overline{X}$ = Mean of the sample

n = Total number of respondents

3.8.3 Pearson's Coefficient Correlation

To find out the association between dependent and independent variables, Pearson's product moment method of computing correlation coefficient was used.

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \ \Sigma y^2}}$$

Where,

r = correlation coefficient

x = Independent variables

y = Dependent variables

Σxy = Sum of product of the deviation of X and Y from their mean

Σx^2 = Sum of square of the deviation of X from their mean

Σy^2 = Sum of square of the deviation of Y from their mean.

3.9 RESEARCH HYPOTHESES

Based on the review of literature, discussions with social scientists and specific objectives of the study, the following hypotheses have been formulated for testing:

$H_{1.1}$ There is no relationship between age of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.2}$ There is no relationship between education of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.3}$ There is no relationship between farming experience of castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.4.}$ There is no relationship between social participation of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.5}$ There is no relationship between occupation of the castor growers and their extent of adoption about hybrid castor production technology.

$H_{1.6}$ There is no relationship between land holding of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.7.}$ There is no relationship between animal possessions of the castor growers and their extent of adoption about hybrid castor production technology.

$H_{1.8}$ There is no relationship between sources of information of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.9}$ There is no relationship between Extension contact of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.10}$ There is no relationship between extension participation of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.11}$ There is no relationship between scientific orientation of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.12}$ There is no relationship between economic motivation of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.13}$ There is no relationship between risk orientation of the castor growers and their extent of adoption of hybrid castor production technology.

$H_{1.14}$ There is no relationship between knowledge of the castor growers and their extent of adoption of hybrid castor production technology.

3.10 THE CONCEPTUAL MODEL

The conceptual framework given was presented paradigmatically which had been developed during the course of study. The model depicted in Figure-4 is tentative and generalized. The final format of such model will be suggested at the end of this

dissertation in the chapter of “summary and conclusion”. The model shows postulated- relationship between variable based on discussion and assumption made earlier. The model explains that the selected characteristics of the hybrid castor grower influencing their adoption of recommended hybrid castor production technology

IV. RESULTS AND DISCUSSION

The data pertaining to present study were collected from castor growers of Kapadvanj taluka of Kheda district through well-structured interview schedule. The collected information was classified, tabulated, analyzed and presented in light of the objectives of the study. The facts and findings derived after analyzing information of the study have been presented under following major heads:

4.1 Socio-personal, agro-economical and communicational characteristics of the farmers growing hybrid castor

4.2 Knowledge level of the farmers about recommended hybrid castor production technology

4.3 Extent of adoption of recommended hybrid castor production technology by the farmers

4.4 Relationship between independent and dependent variables; i.e. Characteristics of the farmers and their adoption of recommended hybrid castor production technology

4.5 Constraints faced by the farmers in adoption of recommended hybrid castor production technology

4.6 Suggestions offered by the farmers to overcome the constraints in adoption of recommended hybrid castor production technology.

4.1 SOCIO-PERSONAL, AGRO-ECONOMICAL, COMMUNICATIONAL AND PSYCHOLOGICAL CHARACTERISTICS OF THE FARMERS

The level of extent of adoption of recommended hybrid castor production technology are influenced by different characteristics of the farmers. It was beyond the scope of present study to include all characteristics of farmers. Therefore, some important characteristics were selected and classified into four groups viz., socio-personal, agro-economical, communicational and Psychological characteristics. The findings of these characteristics have been presented in the following sections.

SOCIO-PERSONAL CHARACTERISTICS

4.1.1 Age

Physical and psychological development of individual is related to age. Young age farmers are more receptive to new ideas/ technologies than old age farmers. Thus it plays influential role in future goals and expectation and thereby it helps in developing positive attitude towards adoption of new technology. Considering this fact, it was thought to study the age of the farmers.

The farmers were asked to indicate their age in complete years and classified in three groups as shown in Table 5 and diagrammatically depicted in Fig 5

Table 5: Distribution of the farmers according to their age

Sr. No.	Age group	Number	Per cent
1	Young (up to 35 years)	20	16.66
2	Middle (36 to 50years)	75	62.50
3	Old (above 50 years)	25	20.84
	Total	120	100

Table 5 shows that majority (62.50 per cent) of the respondent farmers were from middle age group, followed by old (20.84 per cent) and young (16.66 per cent). Thus it can be concluded that majority of the farmers in study area belonged to middle to old age group.

It shows clearly that middle age farmers were mostly involved in farming and being responsible for maintaining the family. Younger generation might be looking for other activities. Old age people might have shouldered off their occupation to successor and now providing only counseling and guidance to family members.

This finding is in conformity with the findings reported by Prajapati (2005) and Kumar *et al.* (2008).

4.1.2 Education

Education is a process of producing desirable changes in human behavior in terms of knowledge, skill and attitude. Education is valued as means of increasing knowledge and information; as a result, individual becomes aware of their own needs and interest for development. Education of farmers' supposed to play pivotal role in understanding and adopting new farm technologies. Keeping this in view, the level of education of the farmers was studied and categorized as shown in Table 6 and diagrammatically depicted in Fig 6

The data presented in Table 6 indicated that majority (56.67per cent) of the respondent farmers has up to secondary level of

education, whereas remaining 25.00 per cent 18.33 per cent were educated up to primary level and above higher secondary level of education respectively.

Table 6: Distribution of the farmers according to their education

Sr. No.	Level of Education	Number	Per cent
1	Primary education (up to 7th std.)	30	25.00
2	Secondary and higher secondary education (8-12th std.)	68	56.67
3	Above higher secondary (Above 12th Std.)	22	18.33
	Total	120	100

From the above facts, it can be concluded that almost all of the respondent farmers in study area were educated. This might be fact that rural people understand the importance of education for their personal development and availability of primary and secondary education in rural area.

The finding is supported by Verma (2000) and Kumar *et al.* (2008).

4.1.3 Farming Experience

Adoption of new farm technology is influenced by their experience in agriculture. Experience helps an individual in developing maturity and ability to face varied situations. It also helps in decision making for adoption of farm innovations.

The data regarding the farming experience of respondent castor growers are presented in Table 7 and diagrammatically depicted in Fig 7

Table.7: Distribution of the farmers according to farming experience

Sr. No.	Farming experience	Frequency	Per cent
1	Low (up to 5 years)	15	12.50
2	Medium (6 to 10 years)	75	62.50
3	High (above 10 years)	30	25.00
	Total	120	100

The above Table 7 disclosed that a majority (62.50 per cent) of the respondent farmers had medium level (6 to 10 years) of farming experience ,whereas, 25.00 per cent and 12.50 per cent of them had high and low level of experience respectively. It means overwhelming (87.50 per cent) of the farmer had medium to high farming experience.

The probable reason of medium to high farming experience might be due to fact that since last five years, castor cultivation is profitable due to its high market price as well as it is suitable as inter crop with cotton. Therefore experienced farmers preferred to grow hybrid castor in place of tobacco or other less remunerative crops.

This result is in conformity with the result of Parmar (2006).

4.1.4 Social Participation

Social participation refers to participation of farmers in local formal or informal organizations. It helps the individual to broaden their vision and insight for self-development in right direction. It denotes the extent to which an individual is actively involved in the affairs of the community. It also plays pivotal role in influencing adoption behavior of the farmers. Those who have wider social contacts

are probably more knowledgeable, resourceful and hence it may help the person in getting exposed with useful ideas and methods. Keeping this in view, social participation of the farmers was studied and data are presented in Table 8 and diagrammatically depicted in Fig 8

It is clear from the Table 8 that more than three fourth (79.16 per cent) of the respondent farmers were associated with various social organizations; among them 70.83 per cent had membership in one organization and 8.33 per cent had membership in more than one organizations and 04.17 per cent of them were office bearers in various social organizations.

Table 8: Distribution of farmers according to their social participation

Sr. No.	Social participation	Frequency	Per cent
1	No membership in any organization	20	16.67
2	Membership in one organization	85	70.83
3	Membership in more than one organizations	10	08.33
4	Office bearer	05	04.17
	Total	120	100

The possible reason for this may be that farmers have felt village organizations as an important service oriented and social

contact oriented organization and existence of different kinds of co-operative sectors in rural areas.

This finding is in concurrence with the findings reported by Prajapati (2005) and Kumar *et al.* (2008).

AGRO-ECONOMICAL CHARACTERISTICS

4.1.5 Occupation

Occupation of the farmers has been considered as one of the important factors that contribute to the annual income and cosmopoliteness of the person. It also reflects socio-economic status of an individual in society. The respondent farmers were asked to state their occupation and it is presented in Table 9 and diagrammatically depicted in Fig 9

It is observed from Table 9 that three fourth (75.00 per cent) of the respondent castor growing farmers were dependent on farming and animal husbandry for their livelihood, followed by farming along with animal husbandry and farm labouring (16.67 per cent) and farming only (08.33 per cent). It means, majority of the respondent farmers in study area were dependent on one or more than one subsidiary occupation along with farming as major occupation.

Table 9: **Distribution of farmers according to their occupation**

Sr. No.	Type of occupation	Frequency	Per cent
1	Farming only	10	08.33
2	Farming along with animal husbandry	90	75.00
3	Farming along with animal husbandry and farm labouring	20	16.67

Total	120	100

From the above results, it can be concluded that animal husbandry and farm labouring were major supporting occupations for great majority (91.67 per cent) of the respondent farmers in study area. This might be due to marginal and small size of land holding which led them to keep milch animal for milk production, which is easily marketed through network of AMUL pattern in village. Moreover, cow dung is used as manure in the field. So animal husbandry perfectly matched to their economic condition, whereas other surplus man power of family were engaged in farm labouring for earning extra income to maintain the family.

This finding is in line with findings reported by Kumar *et al.* (2008).

4.1.6 Land holding

Land holding has been considered as one of the factors that determine the economic status and potentiality of farmers to use new agricultural technology on farm. Size of land holding has also role in maintaining family and socio-economic development, therefore the variable land holding was included in present investigation. Data pertaining to possession of land holding is presented in Table 10 and diagrammatically depicted in Fig 10

Table.10: Distribution of farmers according to their land holding

Sr. No.	Land holding	Frequency	Per cent
1	Marginal farmers (< 1.0 ha)	25	20.83
2	Small farmers (1.01 to 2.0 ha)	45	37.50

3	Medium farmers (2.01 to 4.0 ha)	30	25.00
4	Large farmers (> 4.0 ha)	20	16.67
	Total	120	100

The data presented in Table 10 revealed that 37.50 per cent of the respondent farmers were small farmers having 1. 0 to 2.0 ha of land holding, remaining of them were medium (25.00 per cent), marginal (20.83 per cent) and large (16.67per cent) farmers respectively.

On the basis of above result it can be concluded that majority (62.50 per cent) of the respondent farmers were possessed small to medium size of land holding. It might be due to division of land due to disintegration of joint family system in rural area.

This result is in concurrence with Patel (2000), Prajapati (2005) and Kumar *et al.* (2008).

4.1.7 Animal possession

Possession of milch animal is most common in Indian rural community for getting additional income through selling of milk. It is also one of the important factors that determine the economic status of the farmers. Keeping this in view, the animal possessed by the castor growers was studied and presented in Table 11 and diagrammatically depicted in Fig 11

Table 11: Distribution of farmers according to animal possession

Sr. No.	Animal possession	Number	Per cent
1	No animal	07	05.83

2	Up to 2 animal	41	34.17
4	3 to 5 animals	60	50.00
3	More than 6 animals	12	10.00
	Total	120	100

It is observed from Table 11 that half (50.00 per cent) of the respondent farmers' possessed more than 2 milch animals, followed by up to two milch animals (34.17 per cent) whereas, 05.83 per cent of the farmers did not possess any milch animal.

It can be inferred than great majority (94.17 per cent) of the respondent farmers in study area possessed either two or more than two animals. The probable reason might be that farmers are well aware about the importance of dairying as a source of quick and regular flow of income. Moreever, it provides organic manures to use in their field.

This result is in conformity with the results reported by Patel *et al.* (2003) and Parmar (2006).

COMMUNICATIONAL CHARACTERISTICS

4.1.9 Sources of Farm information

Information sources plays important roles in dissemination of agricultural know - how. Degree of its utilization by the farmer helps them in acquisition of knowledge and skill and adoption of farm technology. On the basis of extent of utilization of information sources, respondents were grouped as shown in Table 12 and diagrammatically depicted in Fig. 12

Table 12: Distribution of farmers according to their over all utilization of the information sources

Sr. No.	Sources of information	Number	Per cent
1	Low (below 15.48 Score.)	17	14.17
2	Medium (Between 15.48 – 18. 96 Score.)	73	60.83
3	High (above 19 Score.)	30	25.00
	Total	120	100

Mean = 17.22 S.D = 1.74

It is observed from Table 12 that more than half (60.83 per cent) of the respondent farmers utilized various information sources at medium level, followed by high (25.00 per cent) and low (14.17 per cent) level of utilization of information sources.

This finding is in conformity with the findings reported by Prajapati (2005), Parmar (2006) and Singh (2007).

Further, it is observed from Table 13 that on the basis of ascending order of various information sources, neighbour farmer (68.33 per cent), progressive farmers (65.00 per cent), neighbour and friends (60.00 per cent), agro-service centers (58.33 per cent) and Village Extension Workers (55.00 per cent) were major sources of information to the castor growing farmers in study area.

This might be due higher education of the respondents and easy availability of sources of information in rural area. (Fig.13)

Table 13: Distribution of farmers according to use of information sources

Sr. No.	Name of Sources	Frequency	Per cent
1.	Neighbour farmers	82	68.33
2.	Progressive farmers	78	65.00
3.	Neighbours & friends	72	60.00
4.	Agro service center	70	58.33
5	VEW	66	55.00
6	Farm magazine	52	43.33
7	Research station	40	33.33
8	News paper	35	29.16
9	TV	25	20.83
10	Radio	20	16.66

This finding is in line with findings reported Prajapati (2005), Parmar (2006) and Singh (2007).

4.1.10.1 Extension contacts

Extension contact considered as the frequency of contact of farmers with the different extension personals and agencies. Adoption of farm technology increased with the increasing of frequency of contacts. Data pertaining to this is presented in Table 14 and diagrammatically depicted in Fig 14

It is observed from Table14 that majority (62.50 per cent) of the respondent farmers had medium level of contacts with different extension agencies, whereas 25.00 per cent and 12.50 per cent respondent farmers had high and low extension contact respectively. This might be due to existence of Government, and private extension agencies in study area.

Table 14: Distribution of farmers according to their extension contact

Sr. No.	Extension contact	Number	Per cent
1	Low (below 15.78 Score.)	15	12.50
2	Medium (between 15.78 -23.44 Score.)	75	62.50
3	High (above 24 Score.)	30	25.00
	Total	120	100

Mean = 19.56 S.D = 3.88

This finding is supported by Jaloriya (2006) and Singh (2007).

4.1.11 Extension participation

Active involvement of farmers in various extension activities play important role in developing knowledge and skill as well as in forming a favourable attitude towards agricultural innovations, which ultimately led them to adopt new technology. In present context, it was conceptualized as the 'degree of involvement of the castor growers in various non formal educational activities' with a view to obtain information, knowledge and skill related to hybrid castor production technology.

On the basis of information collected, hybrid castor growers were categorized in to three groups as shown in Table 15 and diagrammatically depicted in Fig 15

Table 15: Distribution of farmers according to their Extension participation

Sr. No.	Extension participation	Number	Per cent
1	Low (below 17.52 Score)	25	20.83
2	Medium (between 17.52- 25.82 Score.)	65	54.17
3	High (above 26 Score.)	30	25.00

Total	120	100

Mean = 21.67 S.D = 4.15

Table 15 indicated that more than half (54.17 per cent) of the respondent castor growing farmers had medium level of extension participation whereas 25.00 per cent and 20.83 per cent of them had high and low level of extension participation in various extension activities respectively. It means that great majority (79.17 per cent) farmers in study area had medium to high level of extension participation.

The probable reasons for above finding might be higher education, frequent extension contact, active involvement in social organizations, use of mass media and impact of Krushi Mahotsav organized by the Government for transfer of farm information which might have motivate the farmers to participate in extension activities organized by government and State Agricultural University, Non Government organizations and private extension agencies.

This finding is in conformity with the findings reported by Patel (2000) and Parmar (2006).

PSYCHOLOGICAL CHARACTERISTICS

4.1.14 Scientific orientation

Adoption of innovation requires decision by an individual. The decision making process is dependent upon the psychological factors like scientific orientation of the farmers. Therefore, scientific orientation factor was included in the study. In the present context, scientific

orientation was referred as, " The degree to which the castor growing respondent farmers were oriented to use of scientific methods in decision making for adoption of recommended hybrid castor production technology". The data regarding scientific orientation of the respondents were categorized into three groups as shown in Table 16

The data presented in Table 16 that majority (62.50 per cent) of the respondent farmers had medium level of scientific orientation, whereas 25.00 per cent and 12.50 per cent of them had high and low level of scientific orientation, respectively.

Table 16: Distribution of the farmers according to their scientific orientation

Sr. No.	Category	Number	Per cent
1.	Low scientific orientation (below 18.73)	15	12.50
2.	Medium scientific orientation (between 18.73 to 23.87)	75	62.50
3.	High scientific orientation (above 24)	30	25.00
	Total	120	100

Mean=21.30 S.D. = 2.57

It can be concluded that majority of the respondents had medium level of scientific orientation. The probable reason might be their high level of education, participation in social organizations and extension activities and availability of more number of information rural areas.

This finding is similar to the finding reported by Prajapati (2005).

4.1.11 **Economic motivation**

In farming system, economic motivation may be regarded as an indication of degree of willingness for investment of available resources in adoption farm innovations. In the present study, "economic motivation is considered as degree of willingness of beneficiary farmers for investment of their available resources in adoption of recommended hybrid castor production technology.

Respondents were classified in three groups on the basis of their economic motivation as shown in Table 17

Table 17: Distribution of the farmers according to their economic motivation

Sr. No.	Category	Frequency	Per cent
1.	Low economic motivation (below 17.14)	30	25.00
2.	Medium economic motivation (between 17.14 to 23.88)	70	58.33
3.	High economic motivation (above 24.00.)	20	16.67
	Total	120	100

Mean=20.51 S.D. = 3.37

The data presented Table 17 indicate that 58.33 per cent of the respondents had medium economic motivation, whereas 25.00 and 16.67 per cent of the farmers had low and high economic motivation respectively

This finding is similar to the finding reported by Prakash *et al.,* (2003) and Prajapati (2005).

4.1.13 Risk orientation

Risk preference may be described as the degree to which the farmer prefers to bear risk and uncertainty in adoption of innovation. Hence, it has importance in adoption behaviour of the farmers. Thus, it influences knowledge, attitude and skill of farmers. In present study, risk preference has been considered as, 'the degree to which castor growing respondent farmers were oriented towards risks and uncertainty and had courage to face the problems in adoption of recommended hybrid castor production technology'. Respondents were classified into three groups according to their risk bearing capacity as shown in Table 18

A perusal of Table 18 revealed that more than half (54.17 per cent) of the respondent castor growers had medium risk orientation, whereas remaining 25.00 and 20.83 per cent of them had high and low level of risk orientation, respectively.

Table 18: Distribution of the farmers according to their risk orientation

Sr. No.	Category	Frequency	Per cent
1.	Low risk orientation (below 12.57)	25	20.83
2.	Medium risk orientation (between 12.57 to 20.91)	65	54.17
3.	High risk orientation (above 21.00)	30	25.00
	Total	120	100

Mean=16.74 S.D. = 4.14

It can be concluded that majority of the respondents had medium level of risk orientation.

This finding is similar to the finding reported by Prajapati (2005) and Kumar *et al.* (2008).

4.1.14 Knowledge

In the present study, knowledge refers to know-how about recommended hybrid castor production technology possessed by the respondent farmers. Adequate knowledge is essential to farmers for the success and profitable cultivation. Therefore, it was felt necessary to obtain information from the respondent farmers about the knowledge about hybrid castor production technology. The data regarding level of knowledge and practice wise knowledge are given in Table 19 and graphically depicted in Figure 19

Table.19: Distribution of farmers according to their knowledge of hybrid Castor production technology

Sr. No.	Knowledge level	Number	Per cent
1	Low (Below 49.90 Score.)	25	20.83
2	Medium (between 49.90 -71.88 Score)	75	62.50
3	High (above 71.88 Score.)	20	16.67
	Total	120	100

Mean = 60.89 S.D = 10.99

Table 19 indicates that majority (62.50 per cent) of the respondent castor growing farmers had medium level of knowledge about recommended hybrid castor production technology whereas, 20.83 and 16.67 per cent of them had low and high level of knowledge

about recommended hybrid castor production technology respectively. The probable reason might be their higher education, frequent contact with extension agencies and active involvement in various extension activities.

This finding is concurrence with the findings of Anonymous (1998-99) and Prajapati (2005).

Table 20: Practice wise knowledge of the farmers about hybrid castor production technology

Sr.No.	Knowledge	Frequency	Per cent
1	Land preparation	120	100.00
2	Varieties	100	83.33
3.	Time of sowing	92	76.67
4.	Spacing	85	70.33
5.	Seed rate	60	50.00
6.	Fertilizer Management		
	• FYM	82	68.33
	• Chemical Fertilizers	65	54.67
7.	Interculturing	104	86.67

8.	Weed Management		
	• Manual weed control	120	100.00
	• Chemical weed control	20	16.66
9	Irrigation management	100	83.33
10	Plant Protection measures		
	• Pest control	65	54.16
	• Disease control	30	25.00
11	Harvesting	110	91.67

It is observed from Table 20 that all the respondent farmers' knowledge of recommendations namely land preparation and manual weed control. Vast majority of the had high knowledge about the technologies namely, proper time of harvesting (91.67 per cent), inter culturing (86.67 per cent), improved varieties and irrigation (83.33 per cent), time of sowing (76.67 per cent), spacing (70.33 per cent). So far fertilizer management is concerned majority (68.33 per cent) of the farmers had knowledge of FYM application and more than half (54.67 per cent) of them had knowledge recommendations of chemical fertilizers. Whereas more than half (54.16 per cent) and half of the respondents (50.00 per cent) were knowing pest control measures and recommended seed rate. Onefourth (25.00 per cent) had knowledge of diseases control. It is interesting to note that very few (16.66 per cent) had knowledge of chemical weed control.

This finding is concurrence with the findings of Anonymous (1998-99) and Prajapati (2005).

4.3 EXTENT OF ADOPTION OF HYBRID CASTOR PRODUCTION TECHNOLOGY BY THE FARMERS

The "adoption process" is the mental process through which an individual passes from first hearing of an innovation to its final adoption, while adoption is a decision to continue the full use of an innovation. Generally, the farmers do not adopt package of practices fully. There is only a partial adoption by them. As a result, the gap always appears between the recommended production technology and their use at farmer's field. With a view to find out the extent of adoption of recommended hybrid castor production technology, the respondent farmers were asked to give information about package of practices adopted by them. Data regarding this aspect are presented in Table 21 and depicted in Fig 20

Table 21: Distribution of farmers according to extent of adoption of recommended hybrid castor production technology

Sr. No.	Extent of adoption	Number	Per cent
1	Low (Below 46.00 Score.)	30	25.00
2	Medium (between 46.0- 66.57 Score)	70	58.33
3	High (above 67)	20	16.67
	Total	120	100

Mean = 56.30 S.D = 10.27

On perusal of data in Table 21 revealed that majority (58.33 per cent) of the respondent farmers had medium level of extent of adoption of recommended hybrid castor production technology followed by high (16.67 per cent) and low (25.00 per cent).

It can be concluded that a more than three fourth (75.00 per cent) of the respondent hybrid castor growers had medium to high

extent of adoption of recommended hybrid castor production technology. The probable reason may be sincere efforts put forth by various extension agencies to motivate the farmers for adoption of castor production technology.

This finding in line with the findings reported by Anonymous (1998-99), Sachan and Sherma (2004), Prajapati (2005) Singh *et al.* (2006) and Singh and Dangi (2007).

Table 22: Practice wise adoption of recommended hybrid castor production technology by the farmers.

Sr. No	Adoption	Frequency	Per cent
1	Land preparation	120	100
2	Varieties		
	• University recommended	75	62.50
	• Private company	45	37.50
3.	Time of sowing		
	• At recommended time	70	58.33
	• Early Sowing	20	16.67
	• Late sowing	30	25.00
4.	Spacing		
	• At recommended spacing	75	62.50
	• At narrow spacing	35	29.17
	• At wider spacing	10	8.33
5.	Seed rate Kg/ha		
	• As per recommendation	62	51.67
	• Less than recommendation	20	16.67
	• More than recommendation	38	31.66
6.	Fertilizer Management		
6.1	-FYM		
	• As per recommendation	50	41.67
	• Less than recommendation	70	58.33

	• More than recommendation	00	00.00
6.2	-Chemical Fertilizers		
	• As per recommendation	58	48.34
	• Less than recommendation	22	18.33
	• More than recommendation	40	33.33
7.	Interculturing	120	100
8.	Weed Management		
	• Manual weed control	120	100
	• Chemical weed control	00	00
9	Irrigation management		
	• As per recommendations (8 irrigations)	20	16. 67
	• Less than recommendations		
	• 3 – 4 irrigations	40	33.33
	• 5 - 6 irrigations	50	41.67
	• More than recommendations (more than 8 irrigations)	10	08.33
10	Plant Protection measures		
	• Pest control	78	65.00
	• Disease control	00	00
11	Harvesting	120	100

Table 22 indicated that among different recommended hybrid castor production technologies cent respondent farmers followed practice namely land preparation, interculturing, manual weeding and timely harvesting because the farmers knew the importance of these farm operations in production of crop based on their farming experience.

Majority (62.50 percent) of the respondent farmers used university recommended varieties like GCH-4, GCH-5, GCH-6 or GCH-7. The probable reason might be that as compared to varieties

developed by private farm seed producers, the market price of university recommended varieties is affordable to small and marginal farmers and easily available in local market, co-operatives and Government approved Agro Service Centres.

Majority (58.33 per cent) of the respondent farmers had sown their crop at recommended time, whereas 25 per cent and 16.67 per cent of them had sown it late and early respectively. Late sowing might be due to shortage of labours at peak period of sowing time of different crops and high charges of farm labours. Early sowing might be due to lack of knowledge of recommendation.

Majority (62.50 percent) of the respondent farmers followed recommended spacing for sowing the castor crop, followed by narrow spacing (29.17 per cent) and wider spacing (8.17 per cent). Lack of knowledge of recommended spacing might be probable reason for adoption of narrow and wider spacing. It was also observed that slightly more than half (51.67 per cent) of the farmers used recommended seed rate where as 31.66 and 16.67 per cent of them used more and less quantity of seed rate than the recommendation respectively. It might be due to lack of knowledge about recommended seed rate.

So far application of fertilizer management is concerned most all the respondent farmers used either as per recommendation quantity or less quantity of organic manure (FYM) in castor field. In case of application of chemical fertilizers, nearly half (48.34 per cent) of the farmers applied Nitrogenous and Phosphoric fertilizers as per recommendation whereas remaining 33.33 per cent and 18.33 per cent

of them had used it more and less than recommendation respectively. Less quantity was observed particularly in phosphoric fertilizers, while excess use was observed in nitrogenous fertilizers at top dressing. The probable reason for above situation might be due lack of knowledge about recommendation, high cost of chemical fertilizers and sort supply of fertilizers at required time.

In case of irrigation management it is observed that very few (16.67 per cent) of the farmers applied 8 irrigations as per recommendation, whereas 41.67 per cent and 33.33 per cent applied 5 -6 and 3- 4 irrigation respectively to their castor field. It is interesting to note that 8.33 per cent of the farmers applied excess irrigation to their castor field. Lack of knowledge of recommendation of irrigation, irregular supply of electricity for irrigation, high cost of fuel, and high irrigation charges, low level of ground water may be probable reason for application of less number of irrigation, while soil type and facility of canal for irrigation might be responsible for excess use of irrigation.

It is also observed that 65.00 per cent of the respondent farmers adopted pest control measures against castor semilooper and prodenia but none of them were adopted measures against disease control. Probable reason for this situation might be damages caused by pests are easily visible; therefore the farmers cared to protect their crop. In case of disease control, negligible occurrences of diseases and lack of recommendations of disease control.

This finding in line with the findings reported by Anonymous (1998-99), Sachan and Sherma (2004), Prajapati (2005) Singh *et al.* (2006) and Singh and Dangi (2007).

4.4 RELATIONSHIP BETWEEN CHARACTERISTICS OF THE FARMERS AND EXTENT OF ADOPTION OF RECOMMENDED HYBRID CASTOR PRODUCTION TECHNOLOGY

To ascertain the relationship between independent variables i.e. characteristics of the farmers and dependent variables i.e. extent of adoption of hybrid castor production technology the co-efficient of correlation was worked out. Total fourteen socio personal, agro-economic, communicational and psychological characteristics of the farmers were studied. The zero order correlations are presented in Table 23 and discussed under following subheads:

4.2.1 Age and Adoption

Null hypothesis ($H_{2.1}$) is that, "there is no relationship between age of the farmers and their extent of adoption of recommended hybrid castor production technology".

The calculated correlation coefficient value (r = -0.11853) was found not significant at 0.05 level. Hence, null hypothesis ($H_{2.1}$) was accepted and it was concluded that age of the farmers had no relationship with their extent of adoption of recommended hybrid castor production technology.

This finding is in the line of findings reported by Anonymous (1998-1999) and Prajapati (2005).

Table 23: Relationship between characteristics of the castor growers and their extent of adoption about recommended hybrid castor production technology

Sr.No	Independent Variables	Correlation coefficient (r value)
Socio personal		
X_1	Age	-0.11853(NS)
X_2	Education	0.210458*
X_3	Farming experience	0.262655**
X_4	Social participation	0.179944(NS)
Agro-economical		
X_5	Occupation	0.207927*
X_6	Land holding	0.197495*
X_7	Animal possession	0.307012**
Communicational		
X_8	Sources of information	0.322854**
X_9	Extension contacts	0.41991**
X_{10}	Extension participation	0.142975(NS)

Psychological		
X_{11}	Scientific orientation	0.305748**
X_{12}	Economic Motivation	0.329343**
X_{13}	Risk orientation	0.147537(NS)
X_{14}	Knowledge	0.688568**

* Significant at 0.05 level of probability

** Highly Significant at 0.01 level of probability

NS = Non Significant

4.2.2. Education and Adoption

Null hypothesis ($H_{2.2}$) is that, "there is no relationship between education of the farmers and their extent of adoption of recommended hybrid castor production technology".

The calculated correlation coefficient value (r = 0.210458*) was significant at 0.05 level. Hence, null hypothesis ($H_{2.2}$) was rejected and it was concluded that educational status of the farmers was found to have significant relationship with their extent of adoption of recommended hybrid castor production technology. Probable explanation for this finding may that education makes the farmers knowledgeable about farm innovations that motivate them to adopt new farm technology, better experience of farmers in hybrid castor cultivation and sincere efforts made by various extension agencies for transfer of hybrid castor production technology.

This finding has been supported by findings of Anonymous (1998-1999), Kawale (2000) and Prajapati (2005).

4.2.3. **Farming experience and Adoption**

Null hypothesis ($H_{2.3}$) is that, "there is no relationship between farming experience of the farmers and their extent of adoption of recommended hybrid castor production technology".

The calculated correlation coefficient value (r =0.262655**) was found significant at 0.01 level. Hence, null hypothesis ($H_{2.3}$) was rejected and it was concluded that farming experience of the farmers had highly significant correlation with their extent of adoption of recommended hybrid castor production technology.

The possible reason might be that the farmers based farming experience, would have understood the performance and role of particular recommended technology in improving the yield and quality of crop and as a result the farmers might have developed positive attitude toward adoption of recommended hybrid castor cultivation technology.

The finding is in support with the finding reported by Puthira Pratap and Punnuswamy (2006), and Singh (2007).

4.2.4. **Social participation and Adoption**

Null hypothesis ($H_{2.4}$) is that, "there is no relationship between social participation of the farmers and their extent of adoption of recommended hybrid castor production technology".

The calculated correlation coefficient value (r = 0.179944) was found non-significant at 0.05 level. Hence, null hypothesis ($H_{2.4}$) was accepted and it was concluded that social participation of the

castor growers was found non significant with their extent of adoption of recommended hybrid castor production technology.

This might be due to poor economic condition, lack of risk bearing capacity, non availability of farm inputs in local market or unawareness of recommended hybrid castor production technology.

The finding is in support with the finding reported by, Mundhawa and Patel (2000), Joshi (2004) and Patel (2006).

4.2.5 Occupation and Adoption

Null hypothesis ($H_{2.5}$) is that, "there is no relationship between occupation of the farmers and their extent of adoption of recommended hybrid castor production technology".

The calculated correlation coefficient value (r = 0.207927*) was found significant at 0.05 level. Hence, null hypothesis ($H_{2.5}$) was rejected and it was concluded that occupation of the castor growers and their extent of adoption of recommended hybrid castor production technology had significant correlation to each other.

The probable reason might be that occupation is only a factor which influences the annual income of the farmers. The occupation would have increased the income and risk bearing capacity of the farmer which might have motivated them to adopt new farm technology.

4.2.6 Land holding and Adoption

Null hypothesis ($H_{2.6}$) is that, "there is no relationship between land holding of the farmers and their extent of adoption of recommended hybrid castor production technology".

The calculated correlation coefficient value (r=0.197495*) was found significant at 0.05 level. Hence null hypothesis ($H_{2.6}$) was rejected and it was concluded that land holding of the castor growers was positive and significantly correlated with their extent of adoption of recommended hybrid castor production technology.

The probable reasons might be that generally farmers having big size of land holding ultimately having higher income, more exposure with extension personnel and having more social participation which would have help them to become aware about new and recommended technology. Their risk bearing capacity is also high due to higher income.

The findings are in conformity with the findings of Prajapati (2005).

4.2.7 Animal possession and Adoption

Null hypothesis ($H_{2.7}$) is that, "there is no relationship between animal possession of the farmers and their extent of adoption of recommended hybrid castor production technology".

The calculated correlation coefficient value (r = 0.307012**) was significant at 0.01 level, hence null hypothesis ($H_{2.7}$) was rejected and it was concluded that animal possessed by the castor growers and their extent of adoption of recommended hybrid castor production technology had relationship to each other.

This finding derives support from the findings reported by Patel (2000) and Parmer (2006).

4.2.8 Source of Farm information and Adoption

Null hypothesis ($H_{2.9}$) is that, "there is no relationship between sources of farm information of the farmers and their extent of adoption of recommended hybrid castor production technology".

The calculated correlation coefficient value (r = 0.322854**) was found significant at 0.01 level. Hence null hypothesis ($H_{2.9}$) was rejected and it was concluded that various sources of information utilized by the castor growers had positive and significant correlation with their extent of adoption of recommended hybrid castor production technology.

Therefore, it was concluded that intensity of frequency of sources of information utilized helps in changing behaviour of farmers in terms of knowledge and attitude towards new technology that ultimately contributing significant influence on adoption.

The finding is in line with findings reported by, Parmar (2006) and Singh (2007).

4.2.9. Extension contact and Adoption

Null hypothesis ($H_{2.10}$) is that, "there is no relationship between extension participation of the castor growers and their extent of adoption of recommended castor production technology".

The calculated correlation coefficient value (r=0.41991**) was found significant at 0.01 level. Hence null hypothesis ($H_{2.10}$) was rejected and it was concluded that contact of castor growers with various extension agencies had exhibited positive and significant relationship with extent of adoption of recommended hybrid castor production technology. The probable reason might be that frequent

contact and interaction of farmers with various government and non government extension personnel, makes them aware and knowledgeable about the performance of new technologies in increasing the yield and improving the quality of crop that leads to motivate them to adopt recommended hybrid castor cultivation.

Findings reported by Patel (2005) and Zala (2008).

4.2.10 Extension participation and Adoption

Null hypothesis ($H_{2.9}$) is that, "there is no relationship between extension participation of the farmers and their extent of adoption of recommended hybrid castor production technology.

The calculated correlation coefficient value (r = 0.142975) was found non significant at 0.05 level. Hence, null hypothesis ($H_{2.9}$) was accepted and it was concluded that involvement of castor growers in different extension activities had no significant correlation with their extent of adoption of recommended hybrid castor production technology.

The probable reason for this situation might be that due to small size of land holding and limited sources of income farmers could not able to purchase high cost inputs like hybrid seeds, chemical fertilizers and pesticides

Finding reported by Verma and Munshi (2000).

4.2.11 Scientific orientation and Adoption

The null hypothesis (H1: 3.3) is that, "there is no relationship between scientific orientation of the farmers and their

extent of adoption of recommended hybrid castor production technology".

. The data of Table 23 showed that calculated correlation coefficient value (r =0.305748**) was found significant at 0.01 level of probability. Hence, the null hypothesis (H1: 3.3) was rejected and it was concluded that, scientific orientation of the castor growing farmers had shown positive and highly significant correlation with their extent of adoption of recommended hybrid castor production technology.

The possible reasons might be that the farmers with high education attempt to acquire more knowledge regarding new farm technology, higher income, higher participation in social organizations and active involvement in various extension programmes which might have helped to develop progressiveness and wider outlook, leading to creation of scientific mentality. It is quite true that scientifically oriented farmers are likely to have more inclination to use scientific methods in farming, which would have motivated them for higher adoption of recommended hybrid castor production technology.

This finding is being supported by the findings of Prajapati (2005) and Patel (2006).

4.2.12 Economic Motivation and Adoption

Null hypothesis (H1: 3.1) is that, "there is no relationship between economic motivation of the farmers and their extent of adoption of hybrid castor production technology".

The correlation coefficient value (r = 0.329343**) was found to be significant at 0.01 level of probability. Hence, the null hypothesis

(H1: 3.1) was rejected. Therefore, it was concluded that, economic motivation of the castor growing farmers had shown positive and highly significant correlation with their extent of adoption of recommended hybrid castor production technology.

The possible reasons might be that the farmers had better education, better contact with extension agencies, better social as well as extension participation and higher annual income. When these entire variables act together they motivated them to improve their economic activities and economically motivated farmers are oriented towards maximization of profit from farming. They might have considered farming as an enterprise and adopted recommended hybrid castor production technology.

This result gets the support from the findings reported by Prajapati (2005).

4.2.13 Risk orientation and Adoption

Null hypothesis (H1: 3.2) is that, “there is no relationship between risk orientation of castor growers and their extent of adoption of recommended hybrid castor production technology”.

The calculated correlation coefficient value (r = 0.147537) was found non significant at 0.05 level of probability. Hence, null hypothesis (H1: 3.2) was accepted. Therefore, it can be concluded that risk-preferences of the farmers and their extent of adoption of recommended hybrid castor production technology had no any relationship to each other.

This finding is in conformity with the findings of those reported by Verma (1999-2000) and Singh (2006).

4.2.14 Knowledge and Adoption

Null hypothesis (H1: 3.5) is that, “there is no relationship between knowledge level of the farmers and their extent of adoption of recommended hybrid castor production technology”.

The calculated correlation co-efficient value (r = 0.6885**) was found positive and highly significant. Hence, the null hypothesis (H1: 3.5) was rejected and concluded that there was a positive and significant association between knowledge level of the farmers about recommended hybrid castor production technology and their extent of adoption of the same.

The probable reason might be that more education might have resulted in increased knowledge level about recommended hybrid castor production technology which might have contributed for more adoption of recommended hybrid castor production technology by the castor growers.

This finding is in agreement with the findings reported by Verma and Munshi (2000) and Prajapati (2005).

4.4 CONSTRAINTS FACED BY FARMERS IN ADOPTION OF RECOMMENDED HYBRID CASTOR PRODUCTION TECHNOLOGY

There might be number of constraints in adoption of recommended hybrid castor production technology. The constraints may be personal, economical and institutional one. These constraints faced by the farmers hinder the progress of development and hence desired results could not be achieved. Therefore, it was felt necessary to identify constraints faced by the castor growing farmers in adoption of recommended hybrid castor production technology. The respondents were asked to mention the constraints faced by them in adoption of hybrid castor production technology. The constraints expressed by them were noted and it was categorized in five groups namely, technological constraints, economical constraints, service and supply constraints, marketing constraints and information transfer constraints. Based on the frequencies, intensity of particular constraint was converted in percentage and presented in Table 24.

It was observed from Table 24 that, majority of the respondent farmers reported that lack of knowledge about recommended dose of fertilizers (65.50 per cent), lack of knowledge about control measures of pests and diseases (58.33 per cent), lack of knowledge about identification of pest and diseases (56.66 per cent) and lack of knowledge about recommended spacing (50.00 per cent) were their major technological problems in adoption of recommended hybrid castor production technology.

Table 24: Constraints faced by farmers in Adoption of Recommended hybrid castor production Technology

No	Type of constraints	Frequency	Per cent
I	**Technological Constraints**		
1.	Lack of knowledge about recommended dose of fertilizers	75	65.50
2.	Lack of knowledge about control measures of pests and diseases.	70	58.33
3.	Lack of knowledge about identification of pest and diseases	68	56.66
4.	Lack of knowledge about recommended spacing.	64	53.33
5.	Lack of knowledge about recommended sowing time.	50	50.00
6.	Lack of knowledge of university recommended varieties	40	33.33
II	**Economical constraints**		
1.	High cost of fertilizers and pesticides	78	65.00
2.	High cost of labour charges at the time of sowing and picking.	74	61.67
3.	High cost of hybrid seeds	68	56.67
4.	High cost of fuel	62	51.67
5	High irrigation charges	58	48.34
6	Lack of finance for purchasing farm inputs	56	46.67
7	High electricity charges	54	45.00

No	Type of constraints	Frequency	Per cent
III	**Service and supply**		
1.	Labour shortage at the time of sowing and picking.	78	65.00
2.	Sort supply of fertilizers at required time	70	58.33
3.	Irregular supply of canal irrigation water	60	50.00
4.	Non availability of university recommended varieties in local market	54	45.00
5.	Irregular electricity supply	50	41.67
IV	**Marketing constraints**		
1.	Low market price of castor	70	58.33
2.	Lack of storage facility in rural area	72	60.00
3.	Monopoly of private traders in market	65	54.17
4.	Lack of transport facility in rural area	45	37.50
V	**Information transfer**		
1.	Poor contacts of extension workers with farmers	65	54.17
2.	Non availability of farm information in time	62	51.67
3.	Irregularity of extension workers in rural area	58	48.33
4.	Poor knowledge of extension workers about latest technology	50	41.67

So far economical constraints is concerned, majority of respondent hybrid castor growers stated that, high cost of fertilizers and pesticides (65.00 per cent), high cost of labour charges at the time of sowing and picking (61.67per cent), high cost of hybrid seeds (56.67 per cent), high cost of fuel (51.67 per cent) were major economical problems in adoption of hybrid castor production technology. While 65.00, 58.33 and 50.00 per cent of the farmers stated that labour

shortage at the time of sowing and picking, sort supply of fertilizers at required time and irregular supply of canal water for irrigation were major constraints pertaining to service and supply.

In case of problems related to marketing and information transfer, majority of the respondent farmers indicated that low market price of castor (58.33 per cent), lack of storage facility in rural area (60.00 per cent) and monopoly of private traders in market (54.17 per cent) were major marketing problems; whereas poor contacts of extension workers with farmers (54.17 per cent), non availability of farm information in time (51.67 per cent) and irregularity of extension workers in rural area (48.33 per cent) were major constraints regarding information transfer.

4.6 SUGGESTIONS OFFERED BY THE FARMERS TO OVERCOME THE CONSTRAINTS FACED BY THEM

An attempt has been made to ascertain the suggestions offered by the farmers to overcome the various problems faced by them in adoption of recommended hybrid castor production technology. The respondents were requested to give their valuable suggestions to solve the constraints in adoption of recommended hybrid castor production technology. In this regards their responses are presented in Table 23

Table 25 : Suggestions offered by the farmers to overcome constraints in adoption of recommended hybrid castor production technology n=120

Sr.No	Suggestion	Frequency	Per cent
1.	Remunerative market prices of castor seed should be provided to the farmers	110	91.67
2.	Farmers should be protected by crop insurance scheme in case of failure of season	100	83.33
3	Minimum support price of castor should be declared well in advance by Government	96	80.00
4	Extension system should be streamlined to disseminate farm technology.	84	70.00
5.	Proper technical guidance should be given to the farmers as and when they needs.	80	66.67
6.	Timely supply of canal water for irrigation	75	62.50
7	Farm information centers should be established at village level	70	58.33
8.	Electricity should be supplied regularly	68	56.67
9.	Required farm inputs should be made	65	54.17

	available at village level.		
10.	Farm consultancy services should be made available to the farmers at village level.	60	50.00

On the basis of descending order of frequency percentage, it is clearly from Table 25 that great majority of the respondent farmers suggested that remunerative market prices of seed castor should be provided to the (91.67per cent), farmers should be protected by crop insurance scheme in case of failure of season (83.33 per cent), minimum support price of castor should be declared well in advance by Government (80.00 per cent), extension system should be streamlined to disseminate farm technology (70.00 per cent), proper technical guidance should be given to the farmers as and when they needs (66.67 per cent), timely supply of canal water (62.50 per cent), farm information centers should be established at village level (58.33 per cent) ,electricity should be supplied regularly (56.67 per cent) ,required farm inputs should be made available at village level (54.17 per cent) and farm consultancy services should be made available to the farmers at village level (50.00 per cent) to minimize their problems in castor cultivation.

V. SUMMARY AND CONCLUSION

5.1 SUMMARY

In this chapter, a description in nutshell of the present study in respect of major findings, conclusion, implications and suggestions for future research have been given.

Gujarat state ranks first in the country with respect to area, production and productivity among all major castor growing states in the country because of adoption of high yielding hybrid varieties grown as irrigated crop. Gujarat contributes about 4.5 lakh hectares area with an annual production about 6.38 lakh tones of castor seeds. Total area under Castor crop in Gujarat for the year 2007-08 is 354,000 hectares. Average yield for the year 2007-08 is 1838 kg/hectare as against 1757 kg/hectare during the year 2006-07.

Castor is one of the important non-edible oilseeds cash crops of Kheda district since last ten years because of declination of tobacco cultivation and availability of remunerative market price. It is extensively grown in Kapadvanj, Kathlal and Thasara talukas of the district. The area under castor cultivation in the district is 8172 hectare and 11030 tones production having with 1350 kg productivity per hectare. The average yield of the crop is low (1291 kg/ha) as compared to average yield of Research Station (i.e. 2230 to 3000 kg/ha). This indicates that the farmers might be facing

certain problems in castor cultivation. The low yield of hybrid castor could be attributed to the fact that the farmers have not still adopted all the recommended production technologies of the crop to the desired extent. Looking to the importance and urgency of the problem a study entitled “Adoption of Hybrid Castor Production Technology by the Farmers in Kheda District of Gujarat State" was undertaken with the following objectives.

Objectives of the Study:

1. To know the some selected socio-personal, agro-economic, communication and psychological characteristics of the farmers.
2. To ascertain the practice wise knowledge level of the farmers about hybrid castor production technology.
3. To determine the practice wise adoption of hybrid castor production technology by the farmers
4. To find out the association if any between characteristics of the farmers and their extent of adoption of castor production technology
5. To analyze the constraints experienced by the farmers in adoption of hybrid castor production technology
6. To seek the suggestions from farmers to overcome the constraints faced by them in adoption of hybrid castor cultivation.

5.1.1 Review of literature

A brief account of literature reviewed were presented under different seven heads viz., socio-personnel, agro-economic, communication and psychological characteristics of respondents, practice wise knowledge of farmers about crop production technology, extent of adoption of crop production technology by the farmers, association between characteristics of respondents and their extent of adoption of crop production technology, constraints faced by the respondents in adoption of various crop production technologies and their suggestions to minimize the constraints for accelerating the adoption of farm technology. On the basis of literature reviewed to the problem and based on assumption of the study a conceptual model was developed.

5.1.2 Methodology

On the basis of area covered under castor cultivation 10 major castor growing villages were selected randomly and among them 120 farmers were selected by proportionate random sampling technique.

Extent of adoption of hybrid castor production technology was selected as dependent variable; whereas age, education, farming experience, social participation, occupation, land holding, animal possession, , sources of information, extension participation, scientific orientation, economic motivation, risk orientation and knowledge were selected as a independent variables to see their effect on dependent variables. The information pertaining to this study was collected through well structured and

pre tested interview schedule. Frequency, percentage and mean score were used to analyze the data, whereas co-relation co-efficient was calculated to determine the association of independent variables with dependent variable viz; extent of adoption of hybrid castor production technology. For this purpose, null hypotheses were formulated and tested. Ex-post facto design was applied for the study.

5.1.3 CONCLUSION

The important findings of the study are summarized as under:

1. Majority (62.50 per cent) of the farmers were from middle age group, whereas 20.84 and 16.66 per cent were from old and young group respectively.
2. Majority (56.67 per cent) of the farmers had education up to secondary and higher secondary level followed by primary (25.00 per cent) and above higher secondary (18.33 per cent) level of education.
3. Majority (62.50 per cent) of the farmers had medium level (6 to 10 years) of farming experience, whereas, 25.00 per cent and 12.50 per cent of them had high and low level of

experience respectively. It means over whelming (87.50 per cent) of the farmer had medium to high farming experience.

4. More than three fourth (79.16 per cent) of the farmers were associated with various social organizations; among them 70.83 per cent had membership in one organization and 8.33 per cent had membership in more than one organizations.

5. Three fourth (75.00 per cent) of the farmers were dependent on farming and animal husbandry for their livelihood, followed by farming along with animal husbandry and farm labouring (16.67 per cent). Only (08.33 per cent) of them were dependent on farming only It means, majority of the farmers in study area were dependent on one or more than one subsidiary occupation along with farming as major occupation.

6. Majority (62.50 per cent) of the farmers were possessed small to medium size of land holding, among them 37.50 per cent of the farmers were small farmers and 20.83 per cent were marginal farmers.

7. Majority (60.00 per cent) of the farmers' possessed three to more than six milch animals, whereas 34.17 per cent of them possessed up to two milch animals.

8. Majority (60.83 per cent) of the farmers utilized various information sources at medium level, followed by high (25.00 per cent) and low (14.17 per cent) level of utilization of information sources. On the basis of ascending order of various information sources, neighbour farmer (68.33 per cent), progressive farmers (65.00 per cent) neighbour and

friends (60.00 per cent), agro-service centers (58.33 per cent) and Village Extension Workers (55.00 per cent) were major sources of information to the castor growing farmers in study area.

9. Majority (62.50 per cent) of the farmers had medium level of contacts with different extension agencies, whereas 25.00 per cent and 12.50 per cent farmers had high and low extension contact respectively.

10. More than half (54.17 per cent) of the castor growing farmers had medium level of extension participation, whereas 25.00 per cent and 20.83 per cent of them had high and low level of extension participation in various extension activities respectively. It means that great majority (79.17 per cent) farmers in study area had medium to high level of extension participation.

11. Majority (62.50 per cent) of the farmers had medium level of scientific orientation, whereas 25.00 per cent and 12.50 per cent of them had high and low level of scientific orientation respectively.

12. More than half 58.33 per cent of the castor growing farmers had medium economic motivation, whereas 25.00 per cent and 16.67 per cent of the farmers had low and high economic motivation respectively.

13. More than half (54.17 per cent) of the castor growing farmers had medium risk orientation, whereas remaining

25.00 per cent and 20.83 per cent of them had high and low level of risk orientation respectively.

14. Majority (62.50 per cent) of the castor growing farmers had medium level of knowledge about recommended hybrid castor production technology, whereas 20.83 per cent and 16.67 per cent of them had low and high level of knowledge about recommended hybrid castor production technology respectively.

15. So far practice wise knowledge is concerned, all the respondent farmers' had the knowledge of recommendations namely land preparation and manual weed control. Vast majority of the respondents had high knowledge about the technologies namely, proper time of harvesting (91.67 per cent), inter culturing (86.67 per cent), improved varieties and irrigation (83.33 per cent), time of sowing (76.67 per cent), spacing (70.33 per cent), whereas half of the respondents (50.00 per cent) were knowing recommended seed rate. So far fertilizer management is concerned, majority (68.33 per cent) of the farmers had knowledge of FYM application and more than half (54.67 per cent) of them had knowledge recommendations of chemical fertilizers. Whereas more than half (54.16 per cent) and one fourth (25.00 per cent) had knowledge of pest and diseases control. It is interesting to note that very few (16.66 per cent) had knowledge of chemical weed control.

16. Majority (58.33 per cent) of farmers had medium level of extent of adoption of recommended hybrid castor production

technology followed by high (16.67 per cent) and low (25.00 per cent) extent of adoption of recommended castor production technology.

17. Among different recommended hybrid castor production technologies cent of the respondent farmers followed practice namely land preparation, interculturing, manual weeding and timely harvesting.

Majority (62.50 percent) of the farmers used university recommended varieties like GCH-4, GCH-5, GCH-6 and GCH-7.

Majority (58.33 per cent) of the farmers sowing their crop at recommended time, whereas 25 per cent and 16.67 per cent of them were sowing it late and early respectively.

Majority (62.50 per cent) of the farmers followed recommended spacing for sowing the castor crop, followed by narrow spacing (29.17 per cent) and wider spacing (8.17 per cent) respectively

Slightly more than half (51.67 per cent) of the farmers used recommended seed rate whereas 31.66 and 16.67 per cent of them used more or less quantity of seed rate than the recommendation

Majority (58.33 per cent) of the farmers did not use enough quantity of organic manures in their field. Whereas in case of application of chemical fertilizers, nearly half (48.34 per cent) of the farmers applied nitrogenous and

phosphoric fertilizers as per recommendation, remaining 33.33 per cent and 18.33 per cent of them were used it more or less than recommendation. Less quantity was observed particularly in phosphoric fertilizers, while excess use was observed in nitrogenous fertilizers at top dressing.

In case of irrigation management, it was observed that very few (16.67 percent) of the farmers applied 8 irrigations as per recommendation, whereas 41.67 per cent and 33.33 per cent applied 5 -6 and 3- 4 irrigation to their castor field respectively.

It is also observed that 65.00 per cent of the farmers adopted pest control measure against castor semilooper and prodenia but none of them adopted control measures for disease control.

18. Out of fourteen independent variables, six variables viz., education, farming experience, occupation, land holding, possession of milch animals, sources of agricultural information, extension contact, scientific orientation, economic motivation and knowledge had positive and significant correlation with the extent of adoption of hybrid castor production.

19. The constraints faced by the farmers in adoption of hybrid castor production technology are as follows:

Lack of knowledge about recommended dose of fertilizers (65.50 per cent), lack of knowledge about control measures of pests and diseases (58.33 per cent), lack of knowledge about identification of pest and diseases (56.66

per cent) and lack of knowledge about recommended spacing (50.00 per cent) were major technological problems.

High cost of fertilizers and pesticides (65.00 per cent), high cost of labour charges at the time of sowing and picking (61.67per cent), high cost of hybrid seeds (56.67 per cent) and high cost of fuel (51.67 per cent) were major economical problem.

Labour shortage at the time of sowing and picking (65.00 per cent), short supply of fertilizers at required time (58.33 per cent) and irregular supply of canal water for irrigation (50.00 per cent) were major constraints pertaining to service and supply.

Low market price of castor (58.33 per cent), lack of storage facility in rural area (60.00 per cent) and monopoly of private traders in market (54.17 per cent) were major marketing problem, whereas poor contacts of extension workers with farmers (54.17 per cent), non availability of farm information in time (51.67 per cent) and irregularity of extension workers in rural area (48.33 per cent) were major constraints regarding information transfer.

20. To minimize the constraints in adoption of recommended hybrid castor production technology majority of the farmers suggested that :

Remunerative market prices of seed castor should be provided to the (91.67per cent), farmers should be protected by crop insurance scheme in case of failure of season (83.33 per cent), minimum support price of castor should be

declared well in advance by Government (80.00 per cent), extension system should be streamlined to disseminate farm technology (70.00 per cent), proper technical guidance should be given to the farmers as and when they needs (66.67 per cent), timely supply of canal water (62.50 per cent), farm information centers should be established at village level (58.33 per cent) ,electricity should be supplied regularly (56.67 per cent) ,required farm inputs should be made available at village level (54.17 per cent) and farm consultancy services should be made available to the farmers at village level (50.00 per cent).

The tentative conceptual model was laid down in the beginning of this dissertation in Fig 4. Now based on the findings an empirical model is depicted in Figure 21 and Table 23. The model shows that characteristics of the farmers had significant and non-significant relationship with extent of adoption of recommended hybrid castor production technology in correlation analysis.

5.3 IMPLICATIONS OF THE STUDY

1. The findings of the study focus on some of the inherent shortcoming in adoption of hybrid castor cultivation, which will go a long way in providing much needed feedback to the scientists.
2. Efforts should be made to concentrate in the area of organic manure, vermi composting , bio fertilizers, use of chemical fertilizers particularly for phosphoric and nitrogenous fertilizers application, spacing, plant protection measures against pest and

diseases and efficient use of irrigation water, castor, while planning of training programmes for castor growing farmers.

3. The knowledge regarding socio personnel, agro-economic, communicational and psychological attributes of the farmers influencing the extent of adoption of the recommended hybrid castor production technology will be helpful to the extension workers to select right type of farmers for diffusion of modern farm technology.
4. The findings of this study would serve as a guideline for extension agencies, training institutions, and concerned organizations in formation of need based and location specific extension stragey for transfer of castor cultivation technology.

5.4 SUGGESTIONS FOR FUTURE RESEARCH

Present study was carried out under certain limitation of time and available resources with single investigator in limited area. Further research may be conducted on the following lines:

1. Present study was undertaken only in Kapadvanj taluka of Kheda district. It may be replicated in other talukas of Kheda district so that the results of this study will be strengthened.
2. Similar type of study may be conducted with more variables, which were not included in this study in same area.
3. Such study should be repeated after some laps of time in same area so change in adoption pattern of farmers can be known.
4. Such study should be conducted separately in irrigated and semi irrigated area of the district as well as the state.
5. Similar study should be conducted in other castor growing area of

Kheda district as well as other castor growing area of middle Gujarat.

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APPENDIX I

Extent of Adoption of Hybrid Castor Production Technology by the farmers in Kheda District of Gujarat State

Sr.No : Date: / /

PART-I

Socio personal, Agro-Economical, Communicational and Psychological Characteristics of the Farmer

Village:.....		Taluka:.....		Dist:.....

Name of the farmer:.....

1	Age: (Years) :					
2.	Education:	1.	Primary(1-7th standard)	:		
		2.	Secondary(8-10th standard	:		
		3.	Higher Secondary(11 &12th Standard)	:		
		4.	Higher Education(More than 12th Standard	:		
3.	Farming Experience: ..... Years					
4.	Social Participation in Social Institutes					
	No	Name of Institute		Position		
	1.	Village Panchayat				
	2.	Credit Cooperative society				
	3.	Milk cooperative society				
	4.	Yuvak Mandal				
5.	Occupation:					
	No.	Name of Occupation				
	1.	Farming only				
	2	Farming with Animal husbandry				
	3.	Farming along with Animal husbandry and farm labouring				
	4.	Farming with occupation/Service				
6.	**Land holding**	Total .....ha.				
7.	**Animal possession:**					
	No	**Name**		**Number**		
	1.	Bullocks				
	2.	Buffalo				
	3.	Cow(Deshi & Crossbreed)				

8. **Sources of Information** :

No	Name of Source	
1.	Neighbour	
2.	Neighbour farmer	
3.	Relatives/friends	
4.	Progressive Farmer	
5.	Local Leader	
6.	Agro Centre	
7.	Village Level Worker	
8.	Subject Matter Specialist	
9.	Agricultural Scientist	
10.	Kisan call Centre	
11.	Radio	
12.	Television	
13.	News Paper	
14.	Farm Magazines	

9. **Extension contact: For agricultural information to whom you contact?**

No.	Source of Contact	Frequency of contact			
		Most frequent	Frequently	Occasi-onally	Never
1.	Village Level Worker				
2	Agricultural Extension Officer				
3.	Subject Matter Specialist				

	4.	Scientist of Agricultural University				
	5.	Agro Centre				
	6.	Kisan call Centre				

10. **Extension participation:**

Have you participated in any of the following extension activities during last two years? Yes/No. If "yes" give the following details

No.	Name of Activity	Yes	No
1	Have you participated in any agricultural training?		
2	Any farm demonstration was organized on your field by any extension agency during last two years?		
3	Have you participated in any demonstration meeting on demonstration plot conducted on other farmer's field?		
4	Have you participated in farmer's day?		
5	Have you visited any agricultural fair/exhibitions during last two years?		
6	Do you read any farm magazine?		
7	Do you read farm information published in local news papers?		
8	Do you view any agricultural programme on Tele Vision?		
9	Do you listening agricultural Programme broadcasting on radio?		
10	Have you visited any agricultural exhibition during last two years?		

11. **Scientific Orientation**

The following are some statements representing scientific orientation of hybrid castor growers

Please state the degree of agreement by putting tick mark (√) again each of them on five point scale.

No.	Statement	SA	A	UD	DA	SD
1.	Recommended hybrid castor production technology give better results to a farmer					
2.	Hybrid castor growers with lots of					

		experience should adopt Recommended hybrid castor production technology					

	3.	Though it takes time for a hybrid castor growers to learn Recommended hybrid castor production technology, it is worth the efforts					
	4.	A good hybrid castor growers experiments with Recommended hybrid castor production technology					
	5.	Traditional methods of castor cultivation have to be changed in order to raise the standard of living of castor growers					
	6.	The way in which forefathers of castor growers followed castor cultivation is still the best way of castor cultivation					

SA=Strongly Agee, A=Agree, UD=Undecided, DA=Disagree, SD=Strongly Disagree

12. **Economic Motivation:**

The following are some statements representing risk orientation of hybrid castor growers

Please state the degree of agreement by putting tick mark(√) again each of them on five point scale

No.	Statement	SA	A	UD	DA	SD
1.	A hybrid castor grower should rather to take more of chance in a big profit by adopting recommended hybrid castor production technology, but less risky profit					
2.	Hybrid castor grower who willing to take greater risk by adopting recommended hybrid castor production technology usually does better financially					

	3.	It is good for a hybrid castor grower to take risk when he knows his chance of success is fairly high by adopting recommended hybrid castor production technology					
	4.	Adopting recommended hybrid castor production technology involves risk but it is worth taking					
	5.	Hybrid castor growers should grow different type of crops to avoid greater risk involved in adoption of recommended hybrid castor production technology					
	6.	It is better for a hybrid castor growers not to adopt recommended hybrid castor production technology unless most of the other castor growers have used them with success					

SA=Strongly Agee, A=Agree, UD=Undecided, DA=Disagree, SD=Strongly Disagree

PART-II

KNOWLEDGE OF THE FARMERS ABOUT RECOMMENDED HYBRID CASTOR PRODUCTION TECHNOLOGY Please give the answer of the following questions.				
No		Name of technology	Correct	incorrect
I		**Land and land Preparation**		
1.		Which type of soil is suitable to castor crop ……		
2.		How land is prepared for cultivation of Castor Ploughing……; Harrowing……		
II		**Varieties**		
3.		Which are the important varieties of hybrid castor recommended by Gujarat Agril. University 1. …… 2. …… 3. ……		
III		**Seed treatment**		
4.		Give the Name of fungicide and its quantity for seed treatment……		
IV		**Time of Sowing, Spacing and Seed rate**		
5.		What is the recommended time of showing of castor crop? ……		
6.		What is the recommended spacing for castor crop? within the row……cm and between the plants……cm		
7.		What is the recommended Seed rate Kg/ha for castor? …… Kg/ha.		
V		**Fertilizer application**		
8.	•	Organic manure(FYM) ……tone per hectare		
		Chemical fertilizers		
9.		What is the recommend dose of NPK Kg/ha for castor crop?……Kg **N** and …….Kg **P**		

10.		How much Quantity of Nitrogen and phosphorus applied as basal dose? **N** .....Kg , **P** .....kg		
11.		When first top dressing of Nitrogen given to castor crop after sowing?.....days		
12.		How much quantity of Nitrogen applied in first top dressing)?.....Kg		
13.		When Second top dressing of Nitrogen is given to castor crop after sowing? .....Kg.		
14.		How much quantity of Nitrogen is applied in Second top dressing ?.....Kg		
VII		**Inter culturing and Weeding**		
15.		How many days Castor crop should be kept weed free after sowing?.....days		
16.		How many times Inter culturing should be done in castor crop? .....times		
17.		How many times hand weeding should be done in castor crop? .....times		
18.		Do you know the name of recommended herbicides for Chemical weed control? Name:..... Quantity to be used.....(gm)		
VIII		**Irrigation Management**		
19.		How many times castor crop should be irrigated in its crop season? .....irrigations		
20.		When first irrigation should be applied?.....days		
21.		At what interval irrigations should be given to castor crop?..... ...days		
IX		**Plant Protection Measures**		
22		Which are major insect-pests of Castor crop? (1)..... (2)..... (3).....		

23.	Do you know the control measures of these pests?				
		Name of Pest :	Control measures		
	1.				
	2.				
24.		Which are the major diseases occurs in Castor crop?(1).....(2).....(3).....			
25.	Do you know the control measures of the diseases occur in castor crop?				
		Name of Disease	Control Measures		
	1.				
	2.				
	3.				
X		**Harvesting**			
26.		When first harvesting of castor done after sowing?.....days			
27.		How many times castor spikes are harvested? ..... times			
28.		Which implement is used for threshing seed castor from pods?.....			

PART-III

	Extent of Adoption of Recommended Hybrid Castor Production Technology					Adopted	Not Adopted
1.	How many times do you cultivate the field for sowing castor crop? Ploughing.....and harrowing.....						
2.	Which recommended Variety of hybrid castor you have sown? Name of Variety.....						
3.	When do you sowing the castor :						
	15^{th} July -30^{th} July						
	1^{st} August to 15^{th} August:						
	15^{th} August – 31^{st} August						
	1^{st} September -15^{th} September						
4.	Which method do you follow in sowing castor?						
	Drilling:						
	Dibbling:						
5.	At which distance do you sowing the castor crop?						
	60 Cm X 60 Cm						
	90 Cm X 45 Cm						
	90 Cm X 60 Cm						
	120 Cm X 60 Cm						
	150 Cm X 60 Cm.						
6.	How much quantity of Seeds do you used in sowing castor?						
	5 kg /ha	6 to 8 Kg/ha	8 to 10 Kg/ha	10 Kg/ha	More than 10kg/ha		

7.		How much quantity of FYM /ha; do you apply in castor field?.....ton /ha		
8.		How much quantity of Nitrogen do you apply as a basal dose to castor crop? .....Kg/ha.		
9.		How much quantity of Phosphorus do you apply as a basal dose to castor crop? .....Kg/ha.		
11.		How many doses of Nitrogen do you apply as a top dressing to castor crop after sowing? ..... doses		
12.		When first dose of Nitrogen do apply as top dressing to castor crop after sowing? ..... days after sowing		
13.		How much quantity of Nitrogen do you apply to castor crop in first top dressing? .....Kg/ha.		
14.		When Second dose of Nitrogen do apply as top dressing to castor crop after showing? ..... days after sowing		
15.		How much quantity of Nitrogen do you apply to castor crop in Second top dressing? .....Kg/ha.		
17.		How many times do you inter culturing the castor field to keep it free from weeds? .....days		
18.		How many times do you carried out hand weeding in castor field?.....times		
19.		Do you use herbicides for chemical weed control? Yes /No If 'Yes' Give the name of herbicide.....		
21.		How many times do you irrigate the castor crop?		
22.		When do you give first irrigation after sowing?.....days		
23.		At what interval do you irrigate the castor crop? ..... days		

24.		Do you take any control measures of following pest?				
		Name of pest	Name of Pesticide	Quantity(ml/gm)		
25		Do you take any control measures of following diseases?				
		Name of disease	Name of fungicide	Quantity(ml/gm)		

PART-IV

Constraint experienced in adoption of Hybrid Castor Production Technology:

Please let me know the extent to which of the constraints is hindering the adopting of recommended tobacco production technology.

No.	Type of Constraints	
I	Technological Constrains	
1		
2		
II	Economical Constrains	
1.		
2.		
III	Service and Supply	
1.		
2.		
IV	Marketing Constrains	
1.		
2.		
V	Information Transfer	
1.		
2.		

PART-IV

SUGGESTIONS TO OVERCOME THE CONSTRAINTS

What remedial measures would you like to suggest for overcoming

the constraints and thereby promoting the extent the adoption of recommended tobacco production technology

No.	Suggestions
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

APPENDIX –II		
Scientific cultivation of Hybrid Castor		
1.	Suitable soil:	Well drained Medium black and sandy loam
2.	Land preparation:	1 ploughing and 2 or 3 harrowing
3.	Improved varieties:	GCH-4,GCH-5,GCH-6 and GCH-7
4.	Fertilizer management	
4.1	Manures	20 -25 cartload FYM
4.2	Fertilizers:	75 -50 -0 N.P.K ,Kg/h
	⊕ Basal Application	37.5 - 50 – 0 NPK, Kg /ha before sowing
	⊕ Top dressing	18.75 kg N/h; 40 days after sowing
		18.75 kg N/h; 70 days after sowing
5.	Time of sowing	Rainfed -15th July
		Irrigated - 15th July to 15th August
6.	Seed rate,Kg/h.	Dibbling method -5 kg/ha.
		Drilling method - 8 -10 Kg/ha
7.	Spacing:	Rainfed cultivation – 90 cm x 45 cm
		Irrigated cultivation – 90 cm x 60 cm OR 120 cm x 60 cm
8.	Inter culturing & Weed Management	3 -4 inter culturing at an interval of 15 days and 2 hand weeding at and interval of 8-10 days

10	Plant protection:	
10.1	Pest control:	
	Aphid,Jassids and Thryps	Monocrotophos(0.05 %) 15 ml/10 liter water **or** Dimithoate (0.03 %) 15 ml/10 liter water (2 spray at an interval of 15 days)
	Prodenia and castor semi-looper	Endosulfan(0.07 %) 20 ml or Quinalphos(0.05 %) 20 ml or Monocrotophos (0.05 %) 12.5 ml /10 liter water(2 spray at an interval of 15 days)
10.2	Disease control	
	Wilt and root rote	1. Disease resistant varieties-GCH-7, GCH-6
		2. Seed treatment Bavistin. 1 gm or Thyrum 3 gm /kg seed
		3. Deep ploughing after harvesting the crop
		4. Uprooting the disease infested plant
11.	Harvesting	90- 100 days after sowing the crop

Source: Divela ni Vaigyanik kheti ,Series:3:4:23,
Published by: Research Scientist (Castor & Mustard),Gujarat Agricultural University, Sardarkrushinagar-385506 (BK)

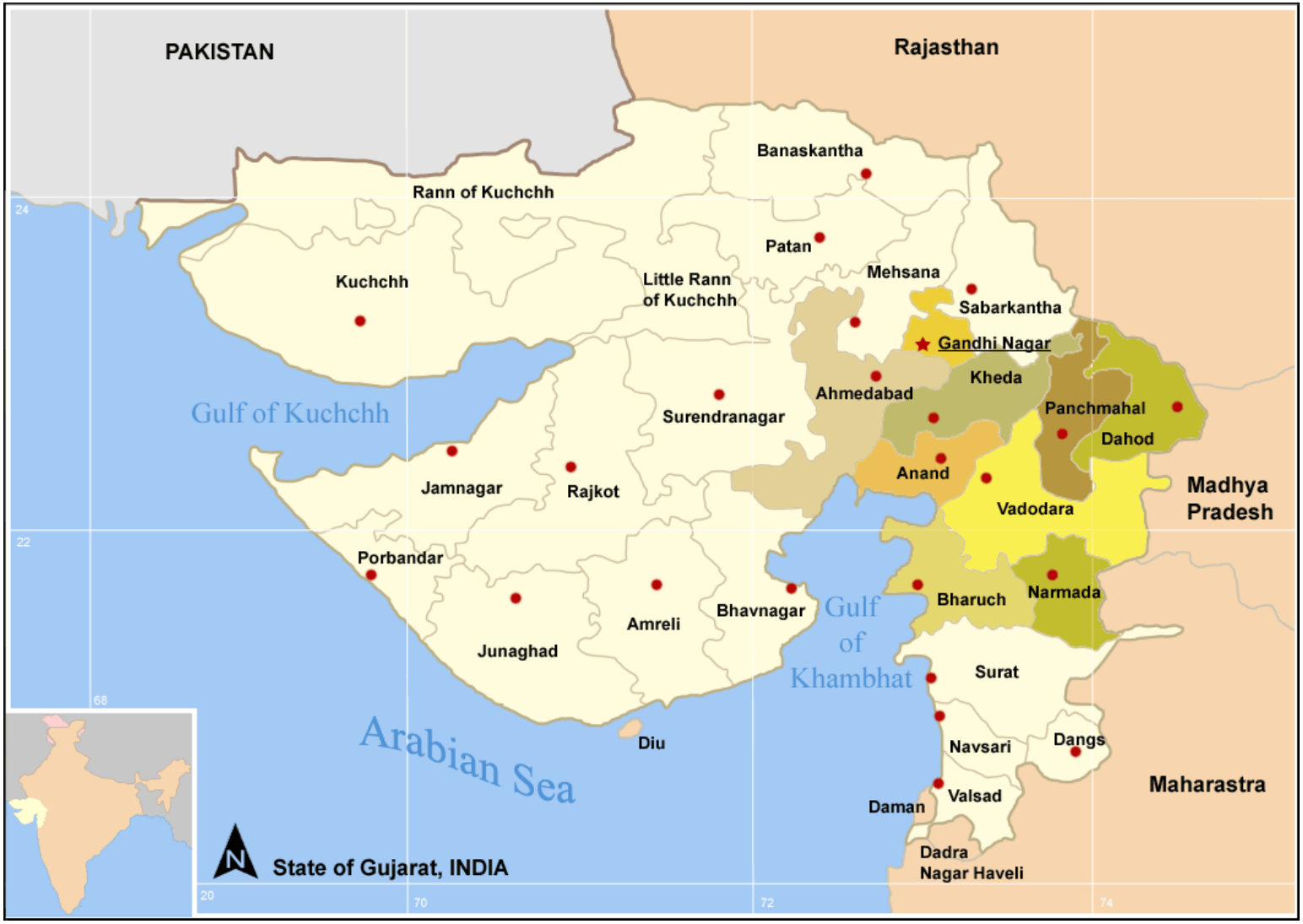
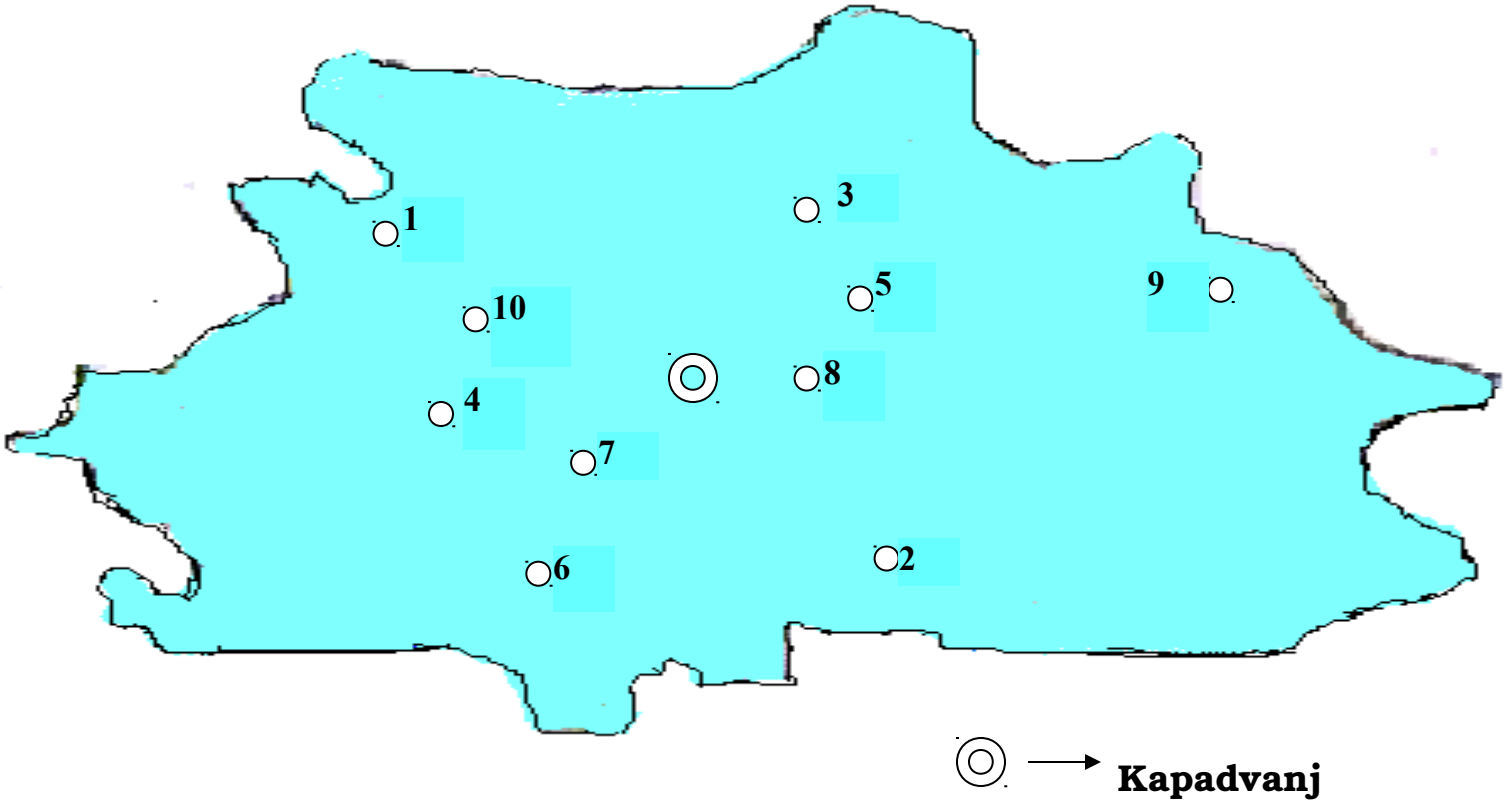


FIG 1: MAP OF GUJARAT STATE SHOWING LOCATION OF KHEDA DISTRICT

FIG. 2: MAP OF KHEDA DISTRICT SHOWING LOCATION OF KAPADVANJ TALUKA



1	Telnar	6	Dana
2	Chikhlod	7	Ambaliyara
3	Kaladinamuwada	8	Sonipura
4	Navagam	9	Kashipura
5	Vyas vasna	10	Karkariya

FIG 3: MAP OF KAPADVANJ TALUKA SHOWING SELECTED VILLAGES

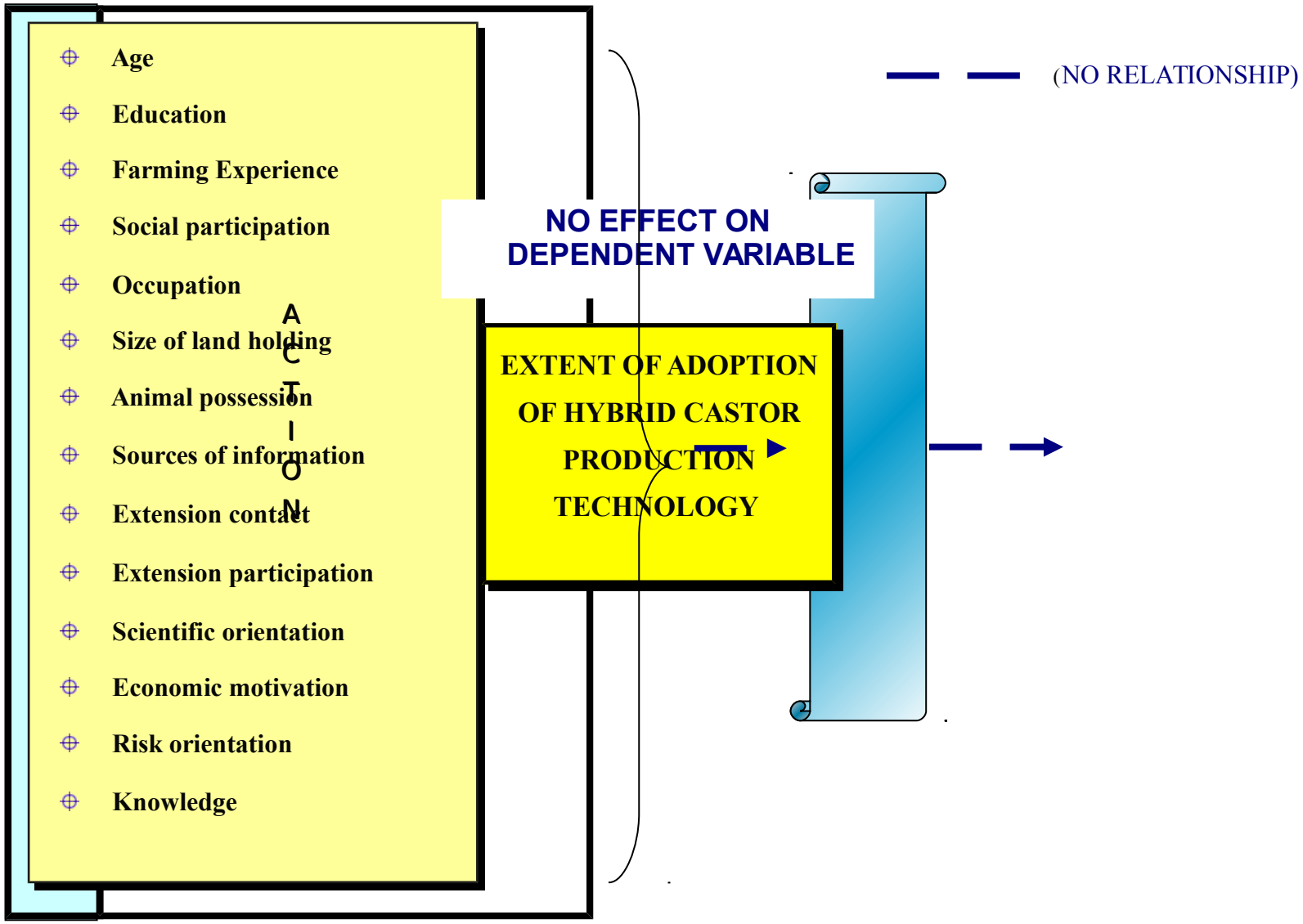


Fig. 4: Conceptual model showing the relationship between independent variables and dependent variable

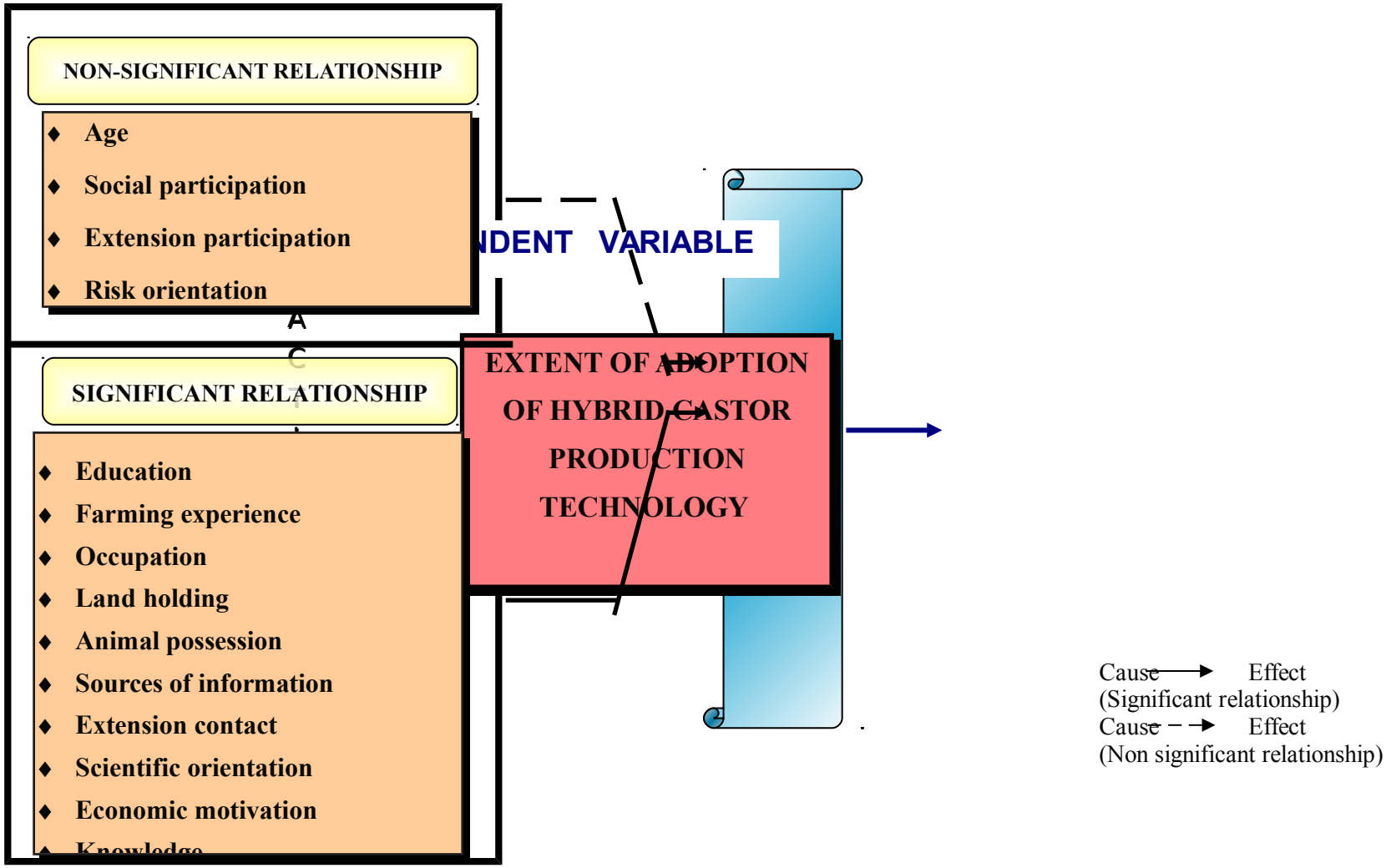


Fig. 21: Empirical model showing influence of independent variable on dependent variable

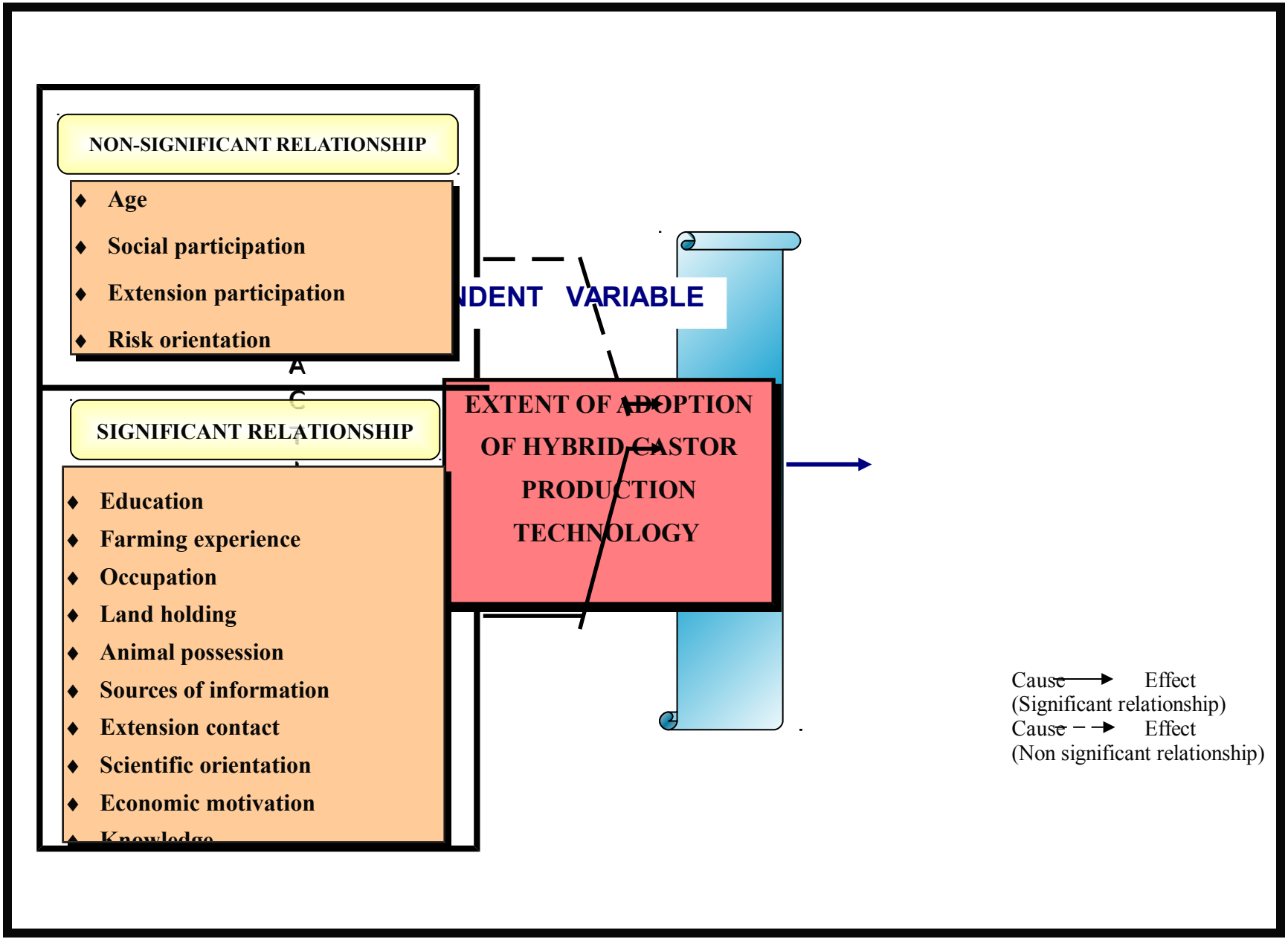


Fig. 21: Empirical model showing relationship of independent variables on dependent variable

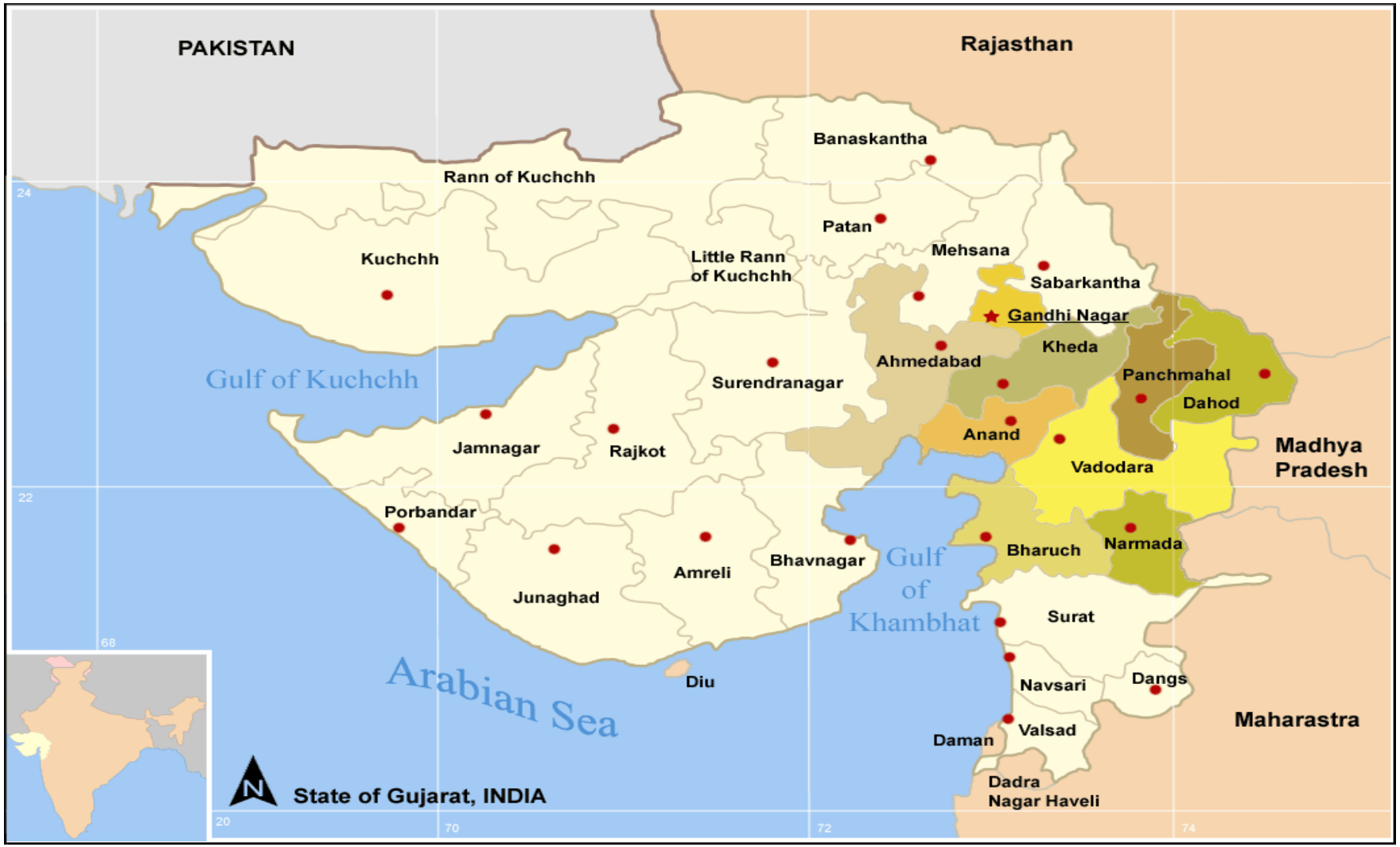

PAKISTAN
Rajasthan
Banaskantha
Rann of Kuchchh
Patan
Mehsana
Kuchchh
Little Rann
of Kuchchh
Sabarkantha
Gandhi Nagar
Kheda
Ahmedabad
Gulf of Kuchchh
Surendranagar
Panchmahal
Dahod
Anand
Jamnagar
Rajkot
Vadodara
Madhya
Pradesh
Porbandar
Bharuch
Narmada
Gulf
of
Khambhat
Amreli
Bhavnagar
Junaghad
Surat
Navsari
Dangs
Diu
Arabian Sea
Maharastra
Daman
Valsad
Dadra
Nagar Haveli
State of Gujarat, INDIA
24
22
20
68
70
72
74

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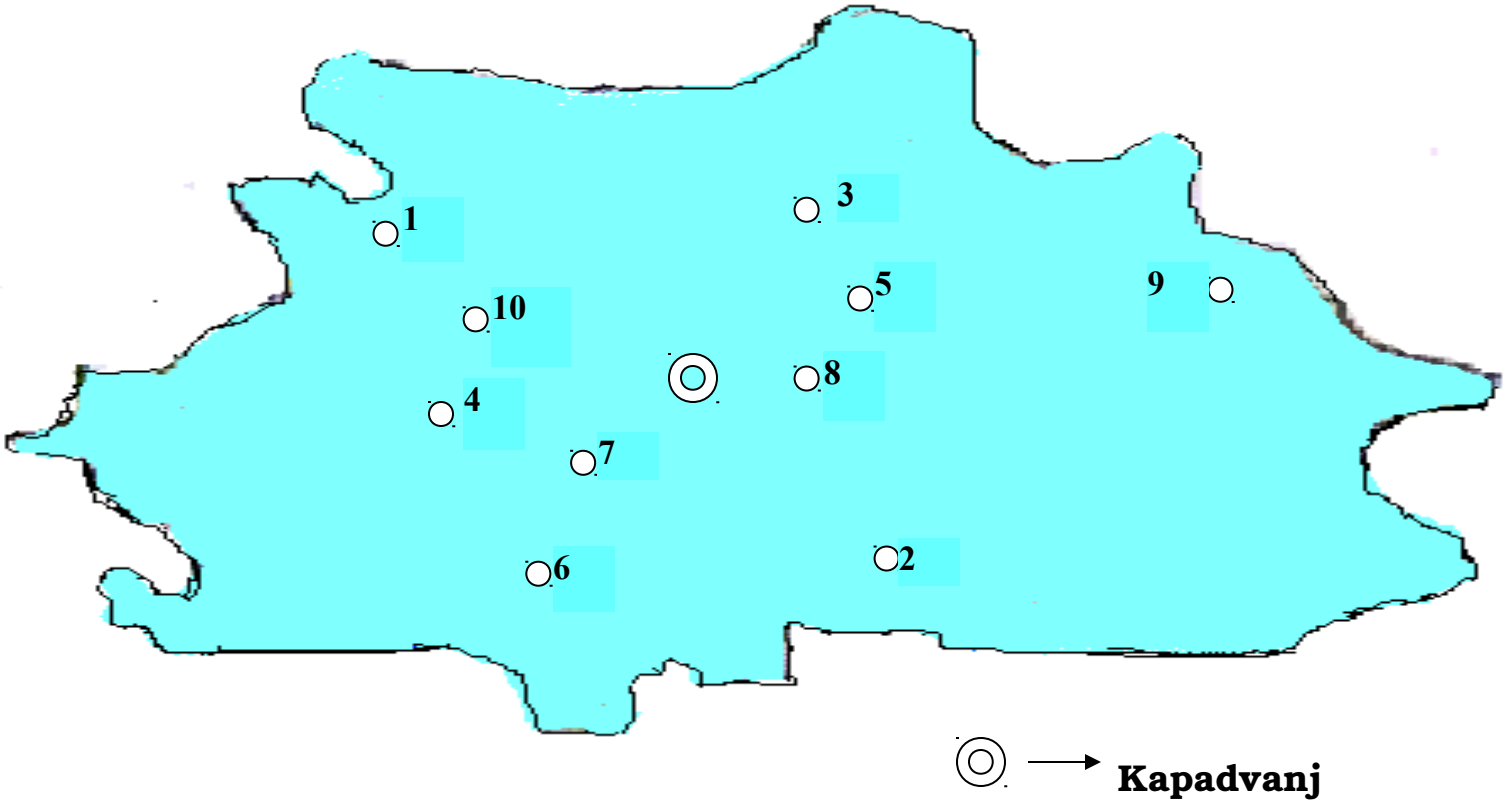
FIG. 2: MAP OF KHEDA DISTRICT SHOWING LOCATION OF KAPADVANJ TALUKA



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