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A study on association between socio-psychological profile of the oil palm growers and impact of oil palm technologies in Andhra Pradesh

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Abstract

Oil Palm has emerged as an important commercial crop both globally and nationally. India is promoting oil palm cultivation to decrease the reliance on imports as well as uplift farmers' livelihood. Oil palm technologies are supposed to impact growers in multifaceted ways. So current study was conducted to determine the relationship and impact of socio-economic and psychological characteristics of the farmers on impact of oil palm technologies. Study was conducted in three agr-climatic zones of Andhra Pradesh. 168 oil palm adopters were selected using multi-stage sampling across three major oil palm-growing districts: *Vizi*anagaram, Eluru, and Nellore. Data were collected through personal interviews using a structured schedule, and analyzed using Karl Pearson's correlation and multiple linear regression techniques in SAS 9.4. The findings revealed that psychological variables such as innovativeness, self-confidence, scientific orientation, and economic motivation had a significant and positive correlation with the impact of oil palm technologies, while risk orientation showed a negative relationship. Among socio-economic variables, education, occupation, farm size, area under oil palm, and extension contact also emerged as significant contributors. Further multiple linear regression revealed that education, farm size, occupation, extension contact, economic motivation, innovativeness, scientific orientation and self-confidence had a significant positive effect on impact ($p < 0.05$). The regression model explained 68.6 per cent of the variation in impact, revealing the combined influence of behavioural and structural factors. The study highlights the need for behaviourally informed extension strategies to enhance psychological capacity and institutional support to enhance the adoption and effectiveness of oil palm technologies.

Keywords: Oil palm technologies, impact, association, psychological, technologies, profile

Introduction

The Oil Palm (*Elaeis guineensis* Jacq) belongs to the family Palmae and sub-family Coccideae which contains 225 genera with over 280 species. It is placed in the Aracaceae family (Adah *et al*. 2022) [1]. It is also known as Macaw fat or African Oil Palm. It is cultivated throughout the tropical belts of Africa, Asia, and Latin America and is widely traded internationally. While Oil Palm has been grown and used locally for centuries, it has boomed during the last few decades due to the rising global demand for vegetable oil (Byerlee *et al*. 2017, Sayer *et al*. 2012) [6, 19]. Oil Palm can produce more vegetable oil per unit of land than any other crop. Among cultivated oilseed crops, Oil Palm has the highest productivity which makes it one of the cheapest oils (Anonymous (a), 2017) [4]. Due to this comparative advantage, palm oil is now commonly used for direct human consumption, as bio-fuel, and as an ingredient in many processed foods, cosmetics, pharmaceuticals, and other industrial products (Corley & Tinker 2016) [7]. The global area under Oil Palm increased from less than 5 million hectares in 1980 to more than 20 million hectares in 2018 (FAO 2019) [9].

The global demand for palm oil has increased significantly since 2000, driven by multiple factors. Economic considerations include palm oil's high yield compared to other vegetable oils, making it cost-effective and profitable (Qaim *et al*. 2020) [22]. The palm oil market is projected to reach $92.84 billion by 2021, reflecting its growing economic importance (Dey *et al*. 2020) [8]. Environmentally, Oil Palm's efficiency in land use compared to other oil crops

has contributed to its expansion, though this has led to deforestation and biodiversity loss in some regions (Meijaard *et al*. 2020) [13]. Technologically, palm oil's versatility in food, feed, and fuel applications has boosted demand, with biodiesel emerging as a significant market (Dey *et al*. 2020) [8]. Its economic impact is substantial, with Indonesia's palm oil exports valued at $23 billion in 2017 (Purnomo *et al*. 2020). Globally, palm oil trade was worth $28.2 billion in 2016, with 75 per cent of production exported (Srisawasdi *et al*. 2023) [20]. However, sustainability concerns persist. Factors such as economic growth, partner proximity, and policies drive palm oil's trade growth (Adhikari *et al*., 2023) [3].

India is the world's largest consumer and importer of palm oil, with demand expected to double by 2030. The country's palm oil import patterns show a mixed trend, with significant growth observed in certain months, particularly August and September (Latha *et al*., 2024) [11]. Key factors influencing palm oil import demand in India include prices of palm oil and substitute oils, national income, biofuel mandates, trade policies, and exchange rates. To reduce its trade deficit, India has implemented strategies to decrease palm oil imports, which impacts bilateral trade with major suppliers like Indonesia. While the Indian government aims to expand domestic Oil Palm cultivation, concerns exist about potential biodiversity and social issues associated with unsustainable expansion. Sustainable palm oil production in India requires an integrated approach involving scientific research, social measures, and political actions to align with global sustainability targets (Sagar *et al*., 2019) [18]. Oil Palm is a perennial source of income to farmers and a continuous source of oil to oil thirsty country like India. In this context it is essential to study the adoption and yield performance of plantations in our country. The above cited view call for a scientific investigation and critical study was designed and conducted with the following objective of association of socio-psychological profile of oil palm growers in Andhra Pradesh.

Materials and Methods

The study was conducted using an *Ex post facto* research design in Andhra Pradesh. Among the six agro-climatic zones of Andhra Pradesh, three zones were purposively selected based on the highest area under oil palm cultivation. The districts were *Vizi*anagaram district, Eluru district and Nellore district. From each selected district, two mandals with the highest oil palm area were purposively selected, resulting in a total of six mandals. From each selected mandal, four villages with the highest area under oil palm were purposively chosen, resulting in a total of 24 villages across the six mandals. From each selected village, seven with oil palm plantations aged 9 years and above (stabilized yield stage) were purposively selected, making a total of 168 oil palm adopters. Three non-oil palm cultivators were purposively selected to study the factors influencing non-adoption, totalling 72 non-adopters. Thus, a total sample of 240 respondents was selected for the study. The profile variables selected for the study were age, education, area under oil pal cultivation, household size, occupation, experience in oil palm cultivation, training undergone, mass media exposure, extension contact, annual income, risk orientation, innovativeness, economic motivation, scientific orientation and self-confidence. The data were collected by personal interview method through structured interview schedule. Karl-Pearson correlation and multiple linear regression was used to determine the relation and effect of farmers' socio-economic and psychological variables with impact of oil palm technologies using SAS 9.4.

Results and Discussion

Descriptive profile of the oil palm growers

Table 1 presents the socio-personal details of the oil palm growers. Majority of the oil palm growers, constituting 55.95 per cent, were in the middle-aged category (36-54 years), one-fifth proportion of respondents (20.83%) had received education up to middle school level and a considerable proportion of the respondents belonged to the medium (30.36%) and large (30.95%) farm size categories. The majority of oil palm growers (64.88 per cent) had a medium area under oil palm cultivation and majority of the respondents (64.29 per cent) belonged to the medium household category and large majority (83.93%) of the respondents reported farming as their sole occupation. The above results were in line with the findings of Brako (2023) [5], Thapa *et al*. (2023) [21] and Reich and Musshoff (2025) [17].

Table 1: Socio-personal profile of the oil palm growers

Variable	Category	Frequency	Percentage
Age	Young (≤35)	12	07.14
	Middle (36-54)	94	55.95
	Old (≥55)	62	36.91
Education	Illiterate	25.0	14.88
	Primary school	23.0	13.69
	Middle school	35.0	20.83
	High school	31.0	18.45
	Intermediate	24.0	14.29
	Graduation	21.0	12.5
	Post Graduation	9.0	5.36
Farm Size	Marginal (≤2.5 acres)	2	1.19
	Small (2.5-5 acres)	17	10.12
	Semi-Medium (5-10 acres)	46	27.38
	Medium (10-25 acres)	51	30.36
	Large (>25 acres)	52	30.95
Area under Oil Palm Cultivation	Low	47	27.98
	Medium	109	64.88
	High	12	7.14
Household size	Small (<2 members)	55.0	32.74
	Medium (2-4 members)	108.0	64.29
	Large (5-6 members)	4.0	2.38
	Very large (>6 members)	1.0	0.6
Occupation	Farming	141.0	83.93
	Farming + Employee	9.0	5.36
	Farming + Business	18.0	10.71
Overall Farming experience	Less than 10 years	5	2.98
	20 to 30 years	52	30.95
	21 to 30 years	57	33.93
	More than 30 years	54	32.14
Experience in oil palm cultivation	Up to 5years	3	1.79
	6 to 10 years	31	18.45
	11 to 15years	61	36.31
	> 15 years	73	43.45

Trainings undergone	No training	49	29.17
	1 to 2 trainings	98	58.33
	More than 2 trainings	21	12.50
Extension Contact	Low	25	14.88
	Medium	138	82.14
	High	5	2.98
Mean = 15.39; SD = 0.83			
Mass Media Exposure	Low	76	45.24
	Medium	80	47.61
	High	12	7.14
Mean = 7.55; SD = 1.07			
Annual income	Low (Rs. 40,111/- to Rs. 70,110/-)	18	10.71
	Medium (Rs. 70,111/- to Rs. 1,00,110/-)	118	70.24
	High (Rs. 1,00,111/- to Rs. 1,30,110/-)	32	19.05
Mean = 1.83 SD = 0.62			

Regarding overall farming experience, majority of the respondents (69.64%) had medium-level overall farming experience. Further regarding experience in oil palm cultivation, findings shows that majority (70.83%) of the respondents had medium experience in oil palm cultivation. Regarding training undergone, more than half (59.52%) of the oil palm growers reported having undergone training related to oil palm cultivation. The findings regarding extension contacts reveals that majority (82.14%) of the oil palm growers had a medium level of extension contact, followed by 14.88 per cent with low contacts. Further regarding mass media exposure that near to half (47.61%) of the respondents had medium mass media exposure. With respect to annual income, more than half (61.90%) had medium level of income followed by high annual income (34.52%). This findings are in line with the findings of Nupueng *et al.* (2023) [14], Yaseen *et al.* (2023) [23] and Hendrawan *et al.* (2024) [10]

Table 2: Psychological profile of oil palm growers

Variable	Category	Frequency	Percentage
Economic Motivation	Low	6	3.57
	Medium	104	61.91
	High	58	34.52
Mean = 28.31; SD = 3.54			
Innovativeness	Low	17	10.12
	Medium	130	77.38
	High	21	12.50
Mean = 27.77; SD = 3.34			
Risk orientation	Low	37	22.02
	Medium	119	70.83
	High	12	7.14
Mean = 23.73; SD = 1.30			
Scientific Orientation	Low	22	13.09
	Medium	113	67.26
	High	33	19.64
Mean = 27.53; SD = 2.5			
Self-confidence	Low	40	23.81
	Medium	104	61.90
	High	24	14.29
Mean = 3.0; SD = 0.7			

Psychological profile of the oil palm growers

Data in Table 2 reveals that majority of the respondents (61.90%) exhibited medium levels of economic motivation and a vast majority of oil palm growers (77.38%) were found to have medium levels of innovativeness. Regarding risk orientation, the majority of the oil palm growers (70.83%) belonged to the medium risk orientation category and about two-third (67.26%) of the oil palm growers had medium scientific orientation. Regarding self-confidence, majority of the oil palm growers (61.90%) were found to have medium self-confidence, followed by 23.81 per cent in the low category and 14.29 per cent in the high category. This findings are in conformity with the results of Lone and Baba (2024) [12].

Table 3: Correlation analysis between profile and impact of oil palm technologies (n=168)

S. No.	Independent variables	Correlation (r)	p-value
1	Age	0.087^{NS}	0.264
2	Education	0.194**	0.010
3a	Farm Size	0.165*	0.040
3b	Area under Oil Palm	0.151*	0.045
4	Household Size	-0.017^{NS}	0.829
5	Occupation	0.221**	0.006
6a	Overall farming Experience	0.100 ^{NS}	0.199
6b	Experience in Oil Palm Cultivation	0.212**	0.007
7	Trainings undergone in Oil Palm cultivation	0.113 ^{NS}	0.140
8	Extension Contact	0.185*	0.016
9	Mass Media Exposure	-0.028 ^{NS}	0.721
10	Annual Income	0.320**	0.000
11	Economic Motivation	0.259**	0.002
12	Innovativeness	0.324**	0.000
13	Risk Orientation	-0.187*	0.015
14	Scientific Orientation	0.231**	0.005
15	Self Confidence	0.282**	0.000

* Significant at 5% level of significance
** Significant at 1% level of significance
NS- Non Significant

From the Table 3, it is found that impact of the oil palm technologies was found to have significant correlation with psychological variables such as innovativeness, economic motivation, risk orientation, scientific orientation, self-confidence. Other profile variables such as education, farm size, area under oil palm, occupation, experience in oil palm cultivation, extension contact, annual income has significant correlation with impact.

Innovativeness (r = 0.324**) and annual income (r = 0.320**) showed the strongest positive correlation with the impact of oil palm technologies. Farmers who were a bit more curious along with financial support, willing to try new things and less hesitant to adopt something unfamiliar, they clearly saw more benefits. Self-confidence had a strong and significant positive correlation (r = 0.282**) with the impact of oil palm technologies. It seems that those who believe in their own judgment and are willing to trust their decisions tend to do better with oil palm adoption. Scientific orientation showed a significant positive correlation (r = 0.231**) with the impact realized by growers. These are probably the farmers who want to understand the "why" behind a recommendation, not just follow it blindly. Similarly farmers with more economic motivation (r = 0.259**) has higher impact of oil palm technologies. Risk orientation had a negative significant correlation. Farmers who were too cautious, or maybe worried about losing money or messing things up, didn't seem to benefit as much.

Education was found to have a significant positive correlation (r = 0.194**) with the impact of oil palm technologies. Education played a role, not too strong, but significant. Educated farmers are generally more confident in asking questions, understanding the technical jargon, or even just keeping up with written instructions. Farm size showed a significant positive correlation (r = 0.165*) with the impact experienced by oil palm growers. Probably because with more land, farmers could take the risk or try things at scale, or maybe they just had more to gain, which made them more serious about implementation. Area under oil palm had a significant positive correlation (r = 0.151*) with the impact of oil palm technologies. Occupation and Experience in oil palm cultivation were also significantly and positively correlated with the level of impact among farmers. Extension contacts had a significant positive correlation (r = 0.185*) with the impact of oil palm adoption. Farmers who interacted with extension workers revealed more benefits. We've seen this in other crops too, the more you're connected to someone guiding you, the less likely you are to go off-track or feel confused. This results are in agreement with the results of Adiprasetyo *et al.* (2019a) [2] and Onoh (2022) [15].

Table 4: Multiple linear regression analysis between profile and impact of oil palm technologies (n=168)

S. No.	Variable	Coefficient (B)	Std. Error	t-value	p-value
1	Age	-0.003	0.017	-0.220	0.826NS
2	Education	0.142	0.053	2.281	0.024*
3a	Farm Size	0.115	0.007	2.158	0.032*
3b	Area under Oil Palm	-0.006	0.009	-0.069	0.945NS
4	Household Size	-0.040	0.096	-0.424	0.672NS
5	Occupation	0.181	0.071	2.822	0.005**
6a	Overall Farming Experience	0.017	0.017	1.009	0.315NS
6b	Experience in Oil Palm Cultivation	-0.002	0.021	-0.133	0.894NS
7	Trainings in Oil Palm Cultivation	0.114	0.185	0.614	0.540NS
8	Extension Contact	0.146	0.106	2.488	0.014*
9	Mass Media Exposure	-0.111	0.181	-0.616	0.539NS
10	Annual Income	0.152	0.101	2.460	0.025*
11	Economic Motivation	0.164	0.163	2.618	0.009**
12	Innovativeness	0.177	0.070	2.537	0.012*
13	Risk Orientation	-0.162	0.073	-2.221	0.028*
14	Scientific Orientation	0.271	0.172	2.333	0.021*
15	Self Confidence	0.347	0.142	2.444	0.016*

* Significant at 5% level of significance
** Significant at 1% level of significance
NS- Non Significant

In order to determine the combined effect of all the selected independent variables in explaining the variation in the impact of oil palm technologies on oil palm growers, Multiple Linear Regression (MLR) analysis was carried out (Table 4). The coefficient of determination (R^2) and the partial regression coefficients (B) along with their corresponding *t* and *p* values were computed and tested for statistical significance. The R^2 value was 0.686, which indicated that all the selected independent variables put together explained about 68.6 per cent of the variation in the impact of oil palm technologies on the respondents. The regression output further revealed that the independent variables education, farm size, occupation, extension contact, annual income, economic motivation, innovativeness, scientific orientation, and self-confidence contributed positively and significantly to the variation in the impact of oil palm technologies at either 5 per cent or 1 per cent levels of probability.

Education had a positive and significant influence, indicating that more educated farmers were better able to understand, accept, and implement the recommended Oil Palm technologies. Farm size was also a significant contributor, suggesting that those with larger landholdings could allocate more area to Oil Palm and thus experienced higher impact. Occupation had a positive and significant association with impact, showing that those more engaged in agriculture realized greater benefits from Oil Palm technologies. Annual income also contributed significantly showing that those with higher income could opt for higher adoption of Oil Palm cultivation. Extension contact was significantly related to impact, emphasizing the role of regular advisories, field visits, and institutional handholding in ensuring technology effectiveness. Economic motivation emerged as a strong behavioural predictor, where profit-driven individuals capitalized more effectively on the technologies promoted. Innovativeness indicated that early adopters and experimenters benefited more from the long-term, high-investment nature of Oil Palm. Scientific orientation, risk orientation and self-confidence also contributed significantly, reflecting that farmers with logical thinking and personal conviction were better able to manage new systems and realize their benefits.

On the other hand, variables such as age, area under Oil Palm, household size, overall experience, experience in Oil Palm cultivation, training attended, and mass media exposure were found to be non-significant in explaining the variance in impact. This suggests that while these variables might support general adoption readiness, they do not independently influence the magnitude of impact realized. Risk orientation showed a negative and significant contribution implying that farmers with higher risk aversion realized lower impact from the adoption of Oil Palm technologies. This revealed the importance of psychological readiness and risk mitigation mechanisms in promoting such long-term agricultural enterprises.

Conclusion

The study was conducted to understand that how different characteristics of farmers influence the way they experience the impact of oil palm technologies in Andhra Pradesh. It can be concluded that, it's not just land size or income that makes the difference, the farmer's mindset plays a major role. Traits like innovativeness and self-confidence found to have strong effect. Farmers who were open to trying new ideas and trusted their own decisions seemed to adopt technologies more readily and follow through with them better. Scientific thinking i.e. the ability to reason through practices and adapt based on observation also effected. On the other hand, being too risk-averse seemed to limit the benefits, which isn't too surprising given the long-gestation nature of oil palm. Socio-economic factors were also very significant. Education helped by making it easier for farmers to interact with extension staff or understand technical

information. Those who were primarily engaged in farming, rather than adopting multiple occupations, also tended to see more impact. While landholding size wasn't the most powerful factor, it has some advantage in terms of flexibility and investment capacity. Regular contact with extension services helped the farmers to realize the impact. It is recommended that extension strategies should focus on behavioural change through behavioural variables. Personalized capacity-building programmes to enhance psychological capacities of the farmers and essential. So extension programmes and policies must be flexible and farmer-segment specific, taking into account variations in socio-economic and psychological levels.

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