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FACTORS INFLUENCING DOUBLING FARMERS' INCOME : A CASE STUDY APPROACH

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ABSTRACT

The study was conducted in Karnataka State with a purposive sample of 100 farmers. An exploratory research design with a case study approach was adopted and used to document cases on progressive farmers to determine the variables influencing the farmers income. The respondents were personally investigated, and their cases have been documented. Data analysis was done by using logistic regression model. Totally 47 factors contributing to doubling farmers' income have been identified from all the progressive farmers' cases using thematic analysis. Logistic regression analysis revealed that factors such as hard work, achievement motivation and getting daily income contribute to a larger extent towards doubling farmers' income, hence should judiciously be addressed while planning the development of programs for the farmers.

Keywords: *prograssive farmers, factors, thematic analysis, logit regression*

INTRODUCTION

The Indian agriculture and allied sectors are the two potential harbingers and roots for the prosperity of rural India because of their high employment and livestock establishment (Vinaya et al., 2018). In addition to meeting the growing population's food and nutritional requirements, the agriculture and allied sectors employ 51% (Census, 2011), contributing 17% to the nation's gross value product (Annual Report 2016-17, MoAFW). In addition, India is blessed with a sizable amount of arable land, measuring approximately 146.45 million hectares (Agriculture Census, 2015–16), 15 agro-climatic zones, and soil types that can support a variety of crops (Sharma, 2021).

In the beginning, a lot of experts had differing opinions on whether the government should double real income or just nominal income by 2022. According to (Dr. M. S. Swaminathan, 2016), the current significant disparity between the potential and actual yield per ha and income suggests that farmers' net income can be doubled. In a similar vein, (Chand, 2016; Satyasai & Bharti, 2016; Thakor & Joshi, 2022) claimed that improving total output, finding a better market, lowering production costs, diversifying the products produced, and implementing effective post-harvest management and value addition can double a farmer's income. In contrast, (Gulati and Shwetha, 2016) believed that increasing farmers' incomes by twofold by the year 2022 is unrealistic and unattainable because doing so would require a compound annual growth rate of 12%. However, (Waghmare, 2016) noted that farmers' income will only double nominally and that real income in 2022 after accounting for inflation will be comparable to 2016. This is because of rising input costs, the inapplicability of the minimum support price, and the lack of market infrastructure. Eventually, doubling a farmer's income is a complex procedure for which the factors responsible for the farmer's income need to be understood. Many studies have attempted to quantify the factors responsible for doubling the farmers' income based on the available literature and secondary source of information. However, the present study aimed to quantify the in-depth information about the farmers regarding the paths and processes behind their well-being and to get the grassroots level evidence which helps to know the factors influencing Doubling Farmers' Income.

OBJECTIVE

To identify and analyse the factors influencing doubling farmers' Income

METHODOLOGY

An exploratory research design with a case study approach was adopted for the present investigation and used to document cases on progressive farmers to find out the variables influencing the farmers to double their farm

income. Karnataka was purposively chosen for the study as the investigator hails from the same state. The list of farmers who have received the farm awards from 2011 to 2017 from the University of Agricultural Sciences, Dharwad, University of Agricultural Sciences, Bangalore, University of Agricultural Sciences, Raichur and University of Agricultural and Horticultural Sciences, Shivamogga (Since 2013) has been collected by the researcher for selection of farmers those who have increased the farm income with their innovative approaches in the farming. The list of farmers who have received awards from the Karnataka State Department of Agriculture and other sources like ATMA was also collected. All the farmers from the organized database were pooled together,. An average of three unique cases of respondents from each district who were considered progressive farmers in Karnataka for their achievements in farming were selected purposively based on the basic criteria of who has increased their income. The total number of unique cases selected for the study was 90 and the other 10 farmers were selected through Snowball sampling technique as per the information given by different sources like fellow farmers, local leaders, scientists of the University and officials of Department of Agriculture and allied who had increased their income but not applied for any award. 100 progressive farmers were investigated, and their cases have been documented.

The researcher took an arduous journey to all the state districts to document all 100 cases of progressive farmers in detail the whole story of each case and its effort to double the farm income.

To get first-hand information and meaningful data for documenting cases of the progressive farmers, an interview schedule was developed, which comprised of measurement of all the variables selected for the study and the other part made a list of different probing questions and indicators to document the entire story or information about all the cases selected for the study.

The case study data was collected primarily through informal discussions with the respondent farmers and also through the indicators listed. The investigator personally interviewed the respondents by administering the interview schedule, which enabled to get first-hand information and allowed observing the respondents.

Data Analysis

The logistic regression model was employed to study the effect of independent variables, i.e. factors elicited from the cases that contributed to Doubling Farmers' Income on the dependent variable, i.e. Doubling Farmers' Income. To Doubling Farmers' Income on the dependent variable i.e. Doubling Farmers' Income. This analysis will help identify the factors that could influence in Doubling Farmers' Income.

R software was used as a statistical package for the analysis.

Variables used for logistic analysis

In the present study, the selection of variables was done with a careful analysis of each variable contributing to DFI. After running stepwise regression and analysing multicollinearity, the variables were considered for the model fitting. For analysis purpose, the DFI is defined as a dichotomous variable by assigning 1 for income of progressive farmers and 0 for non-progressive farmers.

In the present study 47 covariates such as Achievement motivation, Adopting innovative practices, Innovative technologies development, Hard working, Experiential learning, Investigative motivation, Extension contact, Extension participation, Resource utilization, Multiple cropping, Daily incremental income, Cost reduction technologies, Water conserving practices, Soil conserving practices, Agro-forestry, Inquisitiveness to learn, Organic farming, Crop diversification, Institutional support, Animal husbandry farming, Integrated farming system, Fertigation technology, Market-led agriculture, Value addition, Family support, Farm mechanization, Production of organic inputs, Opinion leadership, Research support, Utilization of government facilities, Use of social media, Direct marketing, Azolla unit, Nursery management, Indigenous Technical Knowledge, Group Dynamics, Efficient marketing networks, Online marketing. Training undergone, Hi-tech Agriculture, Zero budget farming, Natural farming, Sericulture, Export oriented agriculture, Agro Tourism, Consultancy services and Hydroponics were considered and after checking significance and multicollinearity, twenty five variables were selected for fitting the logistic model to predict their influence on the Doubling Farmers' Income.

Logistic Model

The model to predict the probability of increase in progressiveness of farmers is

$$\text{Log}\left(\frac{M\text{Progressiveness}}{M\text{Progressiveness}}\right) = \beta_1 (\text{Opinion leadership}) + \beta_2 (\text{Extension contact}) + \beta_3 (\text{Hard working}) + \beta_4 (\text{Investigative motivation}) + \beta_5 (\text{Animal husbandry farming}) + \beta_6 (\text{Value addition}) + \beta_7 (\text{Integrated farming system}) + \beta_8 (\text{Efficient marketing networks}) + \beta_9 (\text{Family support}) + \beta_{10} (\text{Farm mechanization}) + \beta_{11} (\text{Market led agriculture}) + \beta_{12} (\text{Production of organic inputs}) + \beta_{13} (\text{Daily incremental income}) + \beta_{14} (\text{Institutional support}) + \beta_{15} (\text{Adopting innovative practices}) + \beta_{16} (\text{Research support}) + \beta_{17} (\text{Cost reduction technologies})$$

+ β_{18} (Organic farming) + β_{19} (Utilization of government facilities) + β_{20} (Achievement motivation) + β_{21} (Crop diversification) + β_{22} (Inquisitiveness to learn) + β_{23} (Use of social media) + β_{24} (Soil conserving practices) + β_{25} (Agro-forestry)

MProgressiveness is the progressiveness of farmers

Here the odds ratio Exp (B) represents the multiplicative effect of one unit change in the independent variable on the odds of the dependent variable, that is progressiveness of farmers.

RESULTS AND DISCUSSION

Table 1. Logistic regression report of the effect of factors influencing farmers income on doubling farmers' income

Sr. No.	Name of variable	Estimate	Std. Error	z value	Pr(>|z|)	Exp
1	**(Intercept)**	-4.81***	1.04	-4.63	0.00	0.01
2	**Opinion leadership**	0.02	0.74	0.03	0.98	1.02
3	**Extension contact**	0.15	0.77	0.20	0.84	1.16
4	**Hard working**	1.61*	0.74	2.18	0.03	4.99
5	**Investigative motivation**	0.08	0.73	0.11	0.92	1.08
6	**Animal husbandry farming**	0.15	0.69	0.21	0.83	1.16
7	**Value addition**	0.12	0.88	0.14	0.89	1.13
8	**Integrated farming system**	0.54	0.75	0.72	0.47	1.71
9	**Efficient marketing networks**	0.23	0.87	0.40	0.69	1.12
10	**Family support**	0.16	0.74	0.22	0.83	1.18
11	**Farm mechanization**	0.09	0.74	0.12	0.90	1.10
12	**Market led agriculture**	0.35	0.75	0.46	0.64	1.41
13	**Production of organic inputs**	0.41	0.86	0.48	0.63	1.50
14	**Daily incremental income**	1.59*	0.75	2.12	0.03	4.89
15	**Institutional support**	0.63	0.62	1.00	0.32	1.87
16	**Adopting innovative practices**	0.97	0.83	1.17	0.24	2.64
17	**Research support**	0.20	0.80	0.25	0.80	1.22
18	**Cost reduction technologies**	1.08	0.77	1.40	0.16	2.95
19	**Organic farming**	0.92	0.83	1.01	0.27	1.80
20	**Utilization of government facilities**	0.14	0.74	0.19	0.85	1.15
21	**Achievement motivation**	1.97**	0.76	2.60	0.01	7.17
22	**Crop diversification**	0.98	0.85	1.15	0.25	2.66
23	**Inquisitiveness to learn**	1.12	0.80	1.40	0.16	3.05
24	**Use of social media**	0.66	0.69	0.95	0.34	1.93
25	**Soil conserving practices**	0.84	0.76	1.11	0.27	1.43
26	**Agro-forestry**	0.41	0.82	0.49	0.62	1.50

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Null deviance: 166.36 on 119 degrees of freedom
Residual deviance: 103.06 on 94 degrees of freedom
AIC: 155.06

In the logistic regression analysis shown in Table 1, the effects of various factors on the likelihood of farmers doubling their income were examined. The analysis revealed several significant factors that contribute to this outcome, each with its respective odds ratio. The odds ratios indicate how much the odds of doubling income change with a one-unit increase in each factor.

(a) **Opinion Leadership:** For every one-unit increase in opinion leadership, the odds of doubling income increase by 1.02 times. Opinion leaders possess a wide network, granting them access to diverse information sources. Their exposure to innovative ideas from external sources, change agents, and social participation potentially enhances their ability to adopt profitable agricultural technologies. Additionally, while sharing advice, they further enrich their own knowledge.

(b) **Extension Contact:** Increasing extension contact by one unit raises the odds of doubling income by 1.16 times. Improved relations with agricultural institutions, scientists, and NGOs empower farmers with updated information and participation in beneficial programmes. Stronger extension contacts enable more informed decisions, contributing to higher profitability. The connection between counseling contacts and securing a livelihood found to be favorably significant, according to results by Gautam and Jha (2023).

(c) **Hard Working:** With each unit increase in hard work, the odds of doubling income rise by 4.99 times. Hardworking farmers, driven by various responsibilities, engage in diverse activities like crop diversification, cost reduction, and value addition. This dedicated effort enhances their income potential and quality of life.

(d) **Investigative Motivation:** A one-unit increase in investigative motivation results in a 1.08 times greater likelihood of doubling income. Farmers' motivated exploration of optimal practices that balance benefits against costs contributes to successful decision-making and adoption of productive approaches.

(e) **Animal Husbandry Farming:** Increasing involvement in animal husbandry farming by one unit boosts the odds of doubling income by 1.16 times. Integrating livestock and agriculture enhances overall income potential by exploiting diverse product lines, such as meat, milk, eggs, etc. Similar findings were reported by Ravi *et al.* (2023), who found that for marginal and small farmers, off-farm businesses including livestock rearing and nurseries amounted to roughly 26% of total income..

(f) **Value Addition:** For every one-unit increase in value addition efforts, the odds of doubling income increase by 1.13 times. Emphasizing value addition in crops resolves price issues, offering higher returns, access to new markets, and brand recognition, thereby elevating farm income.

(g) **Integrated Farming System:** One unit increase in integrated farming system engagement results in 1.71 times higher odds of doubling income. Integrated farming harmonizes different agricultural components, reducing costs while improving productivity through synergistic interactions.

(h) **Efficient Marketing Networks:** A one-unit increase in efficient marketing network utilization increases the odds of doubling income by 1.12 times. Effective marketing networks facilitate informed decisions by connecting farmers with market information, fostering better production and marketing choices.

(i) **Family Support:** Enhancing family support by one unit increases the odds of doubling income by 1.18 times. Family backing aids farmers in balancing work requirements and personal aspirations, relieving stress and aiding in beneficial decisions.

(j) **Farm Mechanization:** Increasing farm mechanization by one unit raises the odds of doubling income by 1.10 times. Mechanization reduces costs, enhances labour efficiency, and allows farmers to explore diversified income avenues.

(k) **Market-led Agriculture:** A one-unit increase in market-led agriculture boosts the odds of doubling income by 1.41 times. Utilizing market-oriented approaches assists farmers in responding effectively to production and marketing challenges, leading to higher profits.

(l) **Production of Organic Inputs:** Increasing organic input production by one unit raises the odds of doubling income by 1.50 times. Organic farming addresses health concerns, reduces costs, and opens new markets, leading to increased profitability.

(m) **Daily Incremental Income:** For every one-unit increase in daily incremental income, the odds of doubling income rise by 4.89 times. Engaging in multiple income-generating activities provides stability and motivation for sustainable farming.

(n) **Institutional Support:** A one-unit increase in institutional support leads to 1.87 times higher odds of doubling income. Strong institutional connections improve production, marketing services, and technical support, resulting in increased income.

(o) **Adopting Innovative Practices:** Enhancing adoption of innovative practices by one unit increases the odds of doubling income by 2.64 times. Implementing modern technology and practices enhances productivity and overall income.

(p) **Research Support:** Increasing research support by one unit results in 1.22 times greater odds of doubling income. Access to research-backed solutions empowers farmers to innovate, improve production, and offer new technologies to fellow farmers.

(q) **Cost Reduction Technologies:** A one-unit increase in cost reduction technologies elevates the odds of doubling

income by 2.95 times. Adapting cost-effective practices and technologies reduces input costs and drives higher profits.

(r) **Organic Farming:** For every one-unit increase in organic farming, the odds of doubling income increase by 1.80 times. Organic products' higher demand and health benefits lead to premium prices, reducing costs and increasing returns.

(s) **Utilization of Government Facilities:** Enhancing government facility utilization by one unit increases the odds of doubling income by 1.15 times. Leveraging government programmes and schemes aids production improvement and income growth. Vijayan *et al.* (2022) reported similar findings, suggesting that access to RKVY-RAFTAAR may have coincided with the development of entrepreneurial opportunities, the practice of crop diversification, and improved value chain development of the beneficiaries of Karnataka's programme.

(t) **Achievement Motivation:** A one-unit increase in achievement motivation results in 7.17 times higher odds of doubling income. Motivated farmers exert substantial effort, persistence, and determination, achieving excellence in farming and personal accomplishments.

(u) **Crop Diversification:** Increasing crop diversification by one unit boosts the odds of doubling income by 2.66 times. Diversification mitigates risks, enhances community food security, and opens access to new markets.

(v) **Inquisitiveness to Learn:** Enhancing inquisitiveness to learn by one unit increases the odds of doubling income by 3.05 times. Curiosity strengthens survival skills, networking, and innovation adoption, leading to increased income.

(w) **Use of Social Media:** A one-unit increase in social media usage leads to 1.02 times higher odds of doubling income. Utilizing platforms like Facebook, Twitter, and WhatsApp enhances information sharing and innovative practices adoption.

(x) **Soil Conserving Practices:** Increasing soil conserving practices by one unit results in 1.02 times greater odds of doubling income. Conservation techniques preserve soil quality, promoting healthy crop growth and higher revenue.

(y) **Agro-Forestry:** Enhancing agro-forestry by one unit raises the odds of doubling income by 1.02 times. Agro-forestry safeguards land, controls erosion, and provides valuable resources for emergencies.

In summary, the logistic regression analysis identifies various factors influencing farmers' income doubling. Factors such as hard work, adoption of innovative practices, utilization of research and institutional support, and achievement motivation contribute significantly to farmers' ability to achieve higher incomes.

Receiver operating characteristic curve (ROC curve)

The area under the ROC curve for the full model was 0.8744, considered excellent discrimination. The ROC curve is presented in figure 4.27.

Confusion matrix

Table 2. Classification table showing predicted and observed doubling farmers' income scores

Classification table	Doubling Farmers' Income predicted			
Doubling Farmers' Income observed		Non-progressive	Progressive	% correct
	Non-progressive	83	23	78.13
	Progressive	17	77	82.14
			Overall percentage	80.14

The model has correctly predicted 78.13 per cent of observations as non-progressive and 21.87 per cent are incorrectly classified.

(a) Whereas 82.14 per cent of the observations were correctly predicted as progressive by the model and 17.84 per cent are incorrectly classified.

(b) The overall correct percentage was 80.14 per cent, which reflects the overall good strength of the model.

CONCLUSION

This study set out to identify the factors that influence the doubling of farmers' income in Karnataka State. Through the analysis by using logistic regression, found several important factors as significant determinants which lead to increased farmer income. Factors such as hard work, daily incremental income, achievement motivation and adoption of innovative practices have shown considerable impact on farmers' income enhancement. These findings impacted by agricultural industry, rural development and policy creation.

The findings of the study provide the policymakers and agricultural extension organizations to concrete insights into the areas that need focused intervention. Farmers' income can be significantly increased by addressing issues like effective marketing networks, institutional support, and integration of farming systems. Factors like family support, curiosity to learn and value addition can help the farming community to develop strategies for increasing their income. Despite the fact that these results highlight important factors that contributed to an increase in income. Factors like sample size and geographic focus are the limitations of this study. In conclusion, our research emphasizes the elaborate relationship between various factors and increase in farmers' income.

RECOMMENDATION

Future studies could delve further into particular sub-sectors, regional variations, and socio-economic factors that could have a different impact on the variables identified. To achieve the goal of doubling farmers' income, we collectively work with adjusting our strategies to local conditions. Research based decisions will play a pivotal role in shaping a prosperous future for farmers and rural communities

CONFLICT OF INTEREST

This is to declare that there is "No conflict of interest" among researcher.

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