**Determinants of Marketing Channel Choices Among Paddy Farmers in Andhra Pradesh: Insights into Electronic Negotiable Warehouse Receipts (e-NWRs)**

**Abstract**

Warehouses are specialized storage facilities designed for scientific preservation, while receipt systems integrate credit with marketing to enhance marketing efficiency. electronic Negotiable Warehouse Receipts (e-NWRs), plays a crucial role in improving market access and financial security for farmers. This study examined the factors affecting marketing channel choices among paddy farmers in Andhra Pradesh. A multistage sampling technique was used to select 240 farmers from Guntur and Krishna districts, including both e-NWR adopters and non-adopters. Logistic regression analysis was employed to determine key factors affecting the adoption of e-NWR. The results revealed that the education level of farmers (5%), farm size (1%), access to market information (5%), and access to training (5%) significantly influenced warehouse market channel choice. Conversely, age of the farmer (5%) and distance to warehouses (1%) had a negative influence in adoption. The findings emphasized the need for improved infrastructure, financial literacy, improved access to market information & training and awareness programs to promote e-NWR adoption and enhance farmers' market engagement.

**Keywords:** e-NWR, marketing channel, paddy farmers, logistic regression, Andhra Pradesh.

**Introduction**:

 Developments in agricultural production technologies, improvements in the means of transport and storage facilities and marketing infrastructure have also transformed agriculture into a commercial activity. However, these developments have also led to the entry of large number of intermediaries resulting into non remunerative prices to the farmers even though the price of commodities have been going up over years. Farmers have fully realised that more than increasing production, it is important to ensure better markets for their produce. Recognizing that securing better markets is as crucial as increasing production, the Indian Government has implemented policies to enhance the agricultural marketing system, addressing components such as aggregation, grading, storage, transportation, distribution, processing, and value addition (Baskar and Shalendra, 2022).

Providing credit to farmers remains a challenge, further aggravated by the lack of suitable assets for collateral (Shalendra *et al*., 2016). The financial commitments made by the farmers during the production period and low prices at the time of harvesting made them to resort to distress sales. To mitigate this, the government has linked credit with marketing by establishing warehouse receipts. This initiative allows farmers to clear their loans and sell their produce at more remunerative prices.

Warehousing in India gained importance with the 1928 Royal Commission on Agriculture. The 1956 Act established a three-tier system. The WDRA, set up in 2010 under the 2007 Act, introduced Negotiable Warehouse Receipts (NWRs) to enhance agricultural credit. However, adoption was slow due to paperwork, security risks, and inaccuracy, limiting farmers' access to finance. To address this, electronic NWRs (e-NWRs) were introduced on September 26, 2017, and made mandatory for WDRA registered warehouses from August 1, 2019.

Despite these interventions, farmers still struggle to access remunerative prices due to their reliance on traditional marketing channels. Many are unable to participate warehouse-based marketing and adopt e-NWRs due to factors such as limited awareness and understanding, inadequate infrastructure, technological challenges and limited financial literacy. Understanding the key factors influencing farmers' choice between traditional and warehouse-based marketing is crucial for designing effective policies that enhance market participation. In view of this, it is proposed to conduct the study with an objective to determine the factors influencing marketing channel choices across e-NWR and e-NWR non-adopter paddy farmers in Andhra Pradesh.

**Materials and methods:**

Multistage sampling technique was used for the selection of state, districts, warehouses and respondents. Andhra Pradesh state was purposively selected as it stands 6th position in India with a total of 151 WDRA registered warehouses including private warehouses(WDRA, 2023). In Andhra Pradesh, Guntur and Krishna districts which issued highest number of e-NWRs for paddy *i.e* 628 and 531, respectively including APSWC, CWC and private warehouses were selected. Paddy is one of the major crops in Guntur and Krishna districts with an area of 2.54 lakh ha and 2.68 lakh ha, respectively (des.gov.in. 2022-23).

In Andhra Pradesh, From each district, 40 farmers who availed loan from bank by pledging e-NWR as security were selected constituting the 80 farmers. Apart from that, 160 farmers who didn’t store their produce in the warehouse to get e-NWR were selected randomly in the study area thus constituting the total sample of 240 farmers to collect necessary information related to the objective of the present study.

**Data collection:**

The data pertaining to the study were obtained through survey method and enquiries were made with the help of pre-tested structured questionnaire, commercial & cooperative banks and warehouse reports. The present study pertains to the agricultural year 2022-23.

**Materials and Methods:**

A binary logistic regression model based on the cumulative logistic probability function which is computationally easier to use than the probit models was used in this study (Pindyck and Rubinfeld, 1981). It was used to determine the factors that influencing marketing channel choices for paddy between adopters & non-adopters of e-NWR farmers. It gives the maximum likelihood estimates, overcomes most of the problems associated with linear probability models and provides estimators that are asymptotically consistent, efficient and Gaussian. The cumulative logistic probability model is specified as:

Ln (Pi/(1 – Pi) = β0 + β1X1+ ……..+ βnXn + ei.

Where,

 Pi = Marketing channel choice of e-NWR farmer

 1 - Pi = Marketing channel choice of non e-NWR farmer

 β0 = intercept

 βi = Regression coefficients,

 Xi  = Independent variables and

 ei = error term.

For this study, the above equation is expressed implicitly as

 Y = a + b1 X1 + b2 X2 + b3 X3 + b4 X4 + b5 X5 + b6 X6 + b7 X7 + ui

where,

Y = The dependent variable is a binary variable representing the marketing channel choice of e-NWR adopters (1) and otherwise (0)

X1 = Educational level of farmer (years) (0=Illiterate, 1-Primary, 2-Secondary,

 3-Intermediate and 4-Graduate

X2 = Age of the farmer (years)

X3 = Farm size (hectares)

X4 = Off farm income (Rs)

X5 = Access to market information for paddy (1-yes, 0-otherwise)

X6 = Distance to warehouse (Km)

X7 = Access to training (1-yes, 0-otherwise)

b1, b2 . . . b7 are parameters corresponding to estimated variables’ coefficients.

ui is the error term and consists of unobservable random variables.

Marginal effect of a continuous independent variable on the probability. The marginal effect is

|  |  |
| --- | --- |
| dp | = f(bX)b |
| db |

where,

p = the probability of participation in warehouse marketing channel

b = slope coefficients

X = value of explanatory variables

**Results and Discussion:**

Logistic regression was used to determine the factors that influence marketing channel choices for paddy between e-NWR and non e-NWR farmers and the results were presented in Table 1 below.

**Table 1. Factors influencing marketing channel choice of paddy farmers**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** |  **dy/dx** | **Standard Error** |  **P-Value** |
| Educational level of the farmer | 0.425\*\* | 0.197 | 0.045 |
| Age of the farmer | -0.220\*\* | 0.038 | 0.032 |
| Farm Size | 0.402\*\*\* | 0.121 | 0.000 |
| Off farm income | 0.188 | 0.113 | 0.121 |
| Access to market information for paddy | 0.206\*\* | 0.027 | 0.021 |
| Distance to warehouse | -0.667\*\*\* | 0.244 | 0.001 |
| Access to training | 0.713\*\* | 0.648 | 0.045 |
| Pseudo R2 | 0.84 |
| Log likelihood | -75.282 |
| Number of observations | 240 |

Note: \*\*\* significant at 1 per cent level of significance and \*\* significant at 5 per cent level of significance

**Educational level of the farmer:** Educational level of the paddy farmers showed positive relationship with the participation in warehouse-based market and was found statistically significant at five per cent level. The marginal value for this variable 0.425 denotes that the probability of adoption of e-NWR has increased by 42.5 per cent with one level increase in the farmers’ education. Educated farmers were more adaptive to new technologies, efficient in farm management, and better at decision-making. A higher level of education equips farmers with the skills and knowledge needed to maximize the benefits of e-NWR with higher remunerative price, improve productivity, and enhance market participation.

**Age of the farmer:** Age of the farmer showed negative relationship with the probability of participation of paddy farmers in the warehouse-based market and was found statistically significant at five per cent level. The marginal value for this variable -0.220 denotes that the probability of adoption increased by 22 per cent with one year decrease in the farmers’ age. It indicated that age and the farmer's decision to participate had a negative relationship. When compared to older farmers, younger farmers were early adopters to new technologies and more inclined to participate in warehouse-based market. It is known that younger farmers were more inventive and resourceful, which enables them to have better access to market knowledge. Whereas old farmers were habituated to traditional practices and not aware and no interest towards adoption of new technologies.

**Farm Size:** Farm size of the farmer showed positive relationship with the probability of participation of paddy farmers in the warehouse-based marketing channel in the study area. It was found statistically significant at one per cent level with the marginal value of 0.402 which indicated that the probability of participation in warehouse-based market increased by 40.2 per cent with one hectare increase in the farm size. Larger farms typically have higher production volumes, enabling farmers to store their produce in warehouses and take advantage of e-NWRs. Large farmers usually have greater financial resources, higher marketable surplus, access to information & infrastructure and risk management & price optimization. It suggests that improving accessibility for small and marginal farmers, ensuring they can benefit from e-NWRs through financial support and awareness programs.

**Access to market information for paddy:** Access to information was found to have a statistically significant at 5 per cent level of and positive relationship with the participation in the warehouse-based marketing channel. This suggested a beneficial association between farmers' adoption decisions and the access to information. A marginal value of 0.206 showed that a 20.6 per cent increase in the likelihood of participation in warehouse-based market. Access to accurate market information, continuous education, and awareness about e NWR significantly boosts farmer confidence in participating in the warehouse-based marketing system. Timely and transparent information on paddy prices, storage benefits, and loan accessibility can empower farmers to make informed decisions, reduce dependence on middlemen, and improve their income.

**Distance to warehouse:** The participation in warehouse-based marketing channel was negatively correlated with the distance to warehouse and significant at one per cent level. The marginal value for this variable 0.667 denotes that the probability of adoption increased by 66.7 per cent with one km decrease in the distance. Because of lack of proper transportation facilities and non-availability of labour for loading and unloading and risk of transporting the produce to distant warehouses, many farmers selling their produce at farm level. Government intervention in facilitating warehouse operations close to farmers is crucial for reducing transportation costs, improving market access, and increasing farmer participation in e-NWR. Proximity to scientific storage facilities like warehouses allows farmers to store their produce safely, reduce post-harvest losses, and sell at better prices with low transportation costs.

**Access to training:** Paddy farmers who had access to training showed positive and statistically significant relationship with the participation in warehouse-based market at five per cent. A marginal effect value of 0.713 for this variable indicated that the probability of participation in warehouse market increased by 71.3 per cent with increase in the access to training. Regular participation in training programs and awareness campaigns by warehouse management significantly improves farmers' knowledge and ability to manage farms efficiently while increasing their adoption of e-NWR.

**Summary and Conclusion:**

Results revealed the factors affecting marketing channel choices among paddy farmers. Education, farm size, income, market information, and training encouraged adoption, while age and distance to warehouses posed challenges. Farmers with higher level of education, larger farm size, better access to market information and training were more likely to participate in warehouse-based markets. Improved access to market information and training reduced knowledge imbalance and enhanced participation, while greater distances to warehouses limited the adoption of e-NWR. Warehouse management should strengthen the market information systems and develop government-backed digital platforms to provide real-time price updates and establish training programs to enhance farmers’ market awareness. Improving farm to market infrastructure and accessibility and promote decentralized mini-warehouses closer to farming communities to enhance the adoption of e-NWR.

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**Summary of the review**

1. The authors need to revise the abstract as it currently lacks conclusions and recommendations. The introduction is missing a coherent research flow, a clear problem statement, identification of a research gap, novelty, and defined research objectives. Additionally, the manuscript does not address the study's significance. More detailed information on electronic warehouse receipts is necessary, and there are missing citations in the introduction.
2. In the materials and methods section, the authors should include comprehensive details about the study area and provide a map of the study. The research design, sampling procedure, and sample size determination are absent, leaving a total of 240 unexplained. The data collection section requires revision, and the manuscript does not mention the data analysis software or the methods used for data analysis. Diagnostic tests such as multicollinearity, heteroscedasticity, serial correlation, and normality are neither mentioned nor measured.
3. In the results section, the authors did not include descriptive statistics of all the variables used in the study. They presented their findings without comparing them to previous research, which is not acceptable in scientific communication.
4. The conclusion is poorly structured, lacking recommendations or policy implications. The references are insufficient and should be expanded to enhance the manuscript's readability.
5. Overall, this manuscript needs significant revisions before it can be considered for possible publication.

**Read these research papers.**

1. Rachana Chiv, Fengying Nie, Shu Wu & Sokea Tum (2020). Analysis of Factors Influencing Marketing Channel Choices by Smallholder Farmers: A Case Study of Paddy Product in Wet and Dry Season of Prey Veng Province, Cambodia. Journal of Sustainable Development, 13(4):15-34.
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