



Agri-inputs Sourcing Networks of Rice Farmers in Andhra Pradesh and Kerala, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: <https://doi.org/10.9734/jsrr/2024/v30i92361>

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/122442>

Original Research Article

Received: 23/06/2024

Accepted: 26/08/2024

Published: 31/08/2024

ABSTRACT

Agricultural inputs are the underlying elements that are vital for agricultural production. Timely availability and quality of the inputs also have a significant impact on production. Thereby, the study aims to investigate the structure and dynamics of agricultural input sourcing networks among rice farmers in two districts each of Andhra Pradesh (AP) and Kerala. A total of 120 farmers were randomly selected and surveyed. Social network analysis was deployed for the analysis and to delineate the network maps. The results revealed that commercial banks were the major source of financial resources among all four districts. Cooperative banks with an eigen-centrality value of 0.96 were on par with the commercial banks in providing credit to the farmers in Palakkad region of Kerala. In seeds, private dealers were major players in Kurnool, while neighbouring farmers were the major source in East Godavari of AP. In Kerala, Krishi Bhavan was the major source of seeds for farmers in both districts. For other inputs such as fertilisers and plant protection chemicals, farmers in Kurnool sourced majorly from private dealers while East Godavari farmers sourced

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Cite as: Reddy, Suddamalla Manoj Kumar, and Binoo P. Bonny. 2024. "Agri-Inputs Sourcing Networks of Rice Farmers in Andhra Pradesh and Kerala, India". *Journal of Scientific Research and Reports* 30 (9):382-89. <https://doi.org/10.9734/jsrr/2024/v30i92361>.

primarily from both private dealers and cooperatives. In Kerala, farmers sourced other inputs primarily from cooperatives in Thrissur and in Palakkad, farmers sourced them from a farmer producer organisation.

Keywords: Rice farmers; social network analysis; agri-inputs; PACS; input dealers.

1. INTRODUCTION

Agriculture, from very long back is considered as the backbone of India providing a source of livelihood to many people in the nation along with significant contribution to the GDP of the nation. Even during the times of the Covid-19 pandemic, the agricultural sector registered a positive growth rate of 3.3 per cent during 2020-21 and 3 per cent during 2021-22 [1]. Currently, with population of India being around 1.4 billion, and reportedly increasing in the coming years, it is imminent to increase the productivity of the crops given the limited supply of land. Herein, agri-inputs play a vital role as they are the fundamental components in the production process.

Farmers use various inputs throughout agricultural production such as seeds, fertilisers, plant protection chemicals, financial inputs such as credit etc. Timely availability and use of quality inputs and credit are essential to improve production levels. In India, farmers source their inputs from various sources such as public institutions, private dealers, neighbouring farmers, cooperatives, farmer producer organisations etc. India has a large presence of cooperatives namely Primary Agricultural Credit Societies (PACS) at village levels with their presence in around ninety per cent of the villages [2]. These public institutions are widely promoted by the government to provide resources to farmers because of their presence at village levels. Recently, Government of India has also approved a plan to enable PACS to diversify their operations to input supply, grain procurements, marketing etc rather than just providing loans to farmers [3]. Private input dealers too, through their omnipresence, play a major role in supplying inputs to farmers. Also, each state through their extension mechanisms under agricultural offices is performing their roles in input supply to farmers.

All these actors have varying levels of influence and importance in supplying resources to farmers depending on state and location. Mapping of the actors involved in supply of all the inputs will reveal actors which are exerting

more influence in the region and also provides opportunities to further improving their efficiency. Under this context, this study focuses on studying the various input sources of farmers and mapping them using social network maps.

2. MATERIALS AND METHODS

An exploratory research design was used in the study. The study was conducted in Andhra Pradesh and Kerala states of India. East Godavari and Kurnool districts of Andhra Pradesh and Palakkad and Thrissur districts of Kerala were selected based on their higher area under rice cultivation along with their proneness to natural hazards as reported by Rao et al. [4]. One village from each of the districts was selected randomly. The selected areas were visually represented in Fig. 1. In each village, 30 farmers were randomly surveyed making a total of 120 farmers across all four villages.

For mapping of the resource networks, social network analysis (SNA) was used. Farmers were asked to name the sources from whom they sourced the inputs namely, fertilisers and plant protection chemicals, seeds and credit. The data collected was analyzed using Gephi V.0.10.1. software.

3. RESULTS AND DISCUSSION

A summary of all major actors in each of the resource networks of paddy farmers in the four districts of AP and Kerala are presented in Table 1.

The resource-sourcing network maps of paddy farmers in both states are given in Figs. 2 and 3 respectively. The networks consisted of the actors involved in sourcing financial resources, seeds and other inputs such as fertilizers and plant protection chemicals.

In the Kurnool region, from Fig. 2a, it could be observed that commercial banks were the primary source of paddy farmers' financial resources in the district, which was reflected by the Eigencentality value of 1. Though PACS were also present in the network, their influence

was significantly low in the network, as evidenced by the Eigenvalue of 0.21. This could be mostly attributed to the poor functioning of the PACS in the region. In the case of seeds, private dealers in the nearby town were the major actors, followed by Rythu Bharosa Khendra (RBK), a regional agriculture office and neighbouring farmers. RBK, though played a major role with an Eigenvalue of 0.36 in the seeds sourcing network of the farmers, its role is less compared to private dealers in Nandyal town with an Eigenvalue of 0.57. This was mostly because the RBK's supply of seeds was in limited quantity which normally did not meet the requirements of the farmers. Several other researchers also highlighted the lack of timely availability and also

the unavailability of inputs at the RBKs [5,6] which led the farmers to rely on private sources and purchase seeds from other farmers. Similarly, in other inputs, private dealers in Nandyal town were the major actors with a value of 0.75, followed by private dealers in Rudravaram village. A significant factor that needed to be considered in this context was that in all three networks, major actors were located in nearby towns and villages. This increased the cultivation costs because of the logistic charges the farmer incurred in transporting the resources. Hence, it is imperative to improve the status of actors that were regionally present in the network, such as PACS, RBK and private dealers in the village.

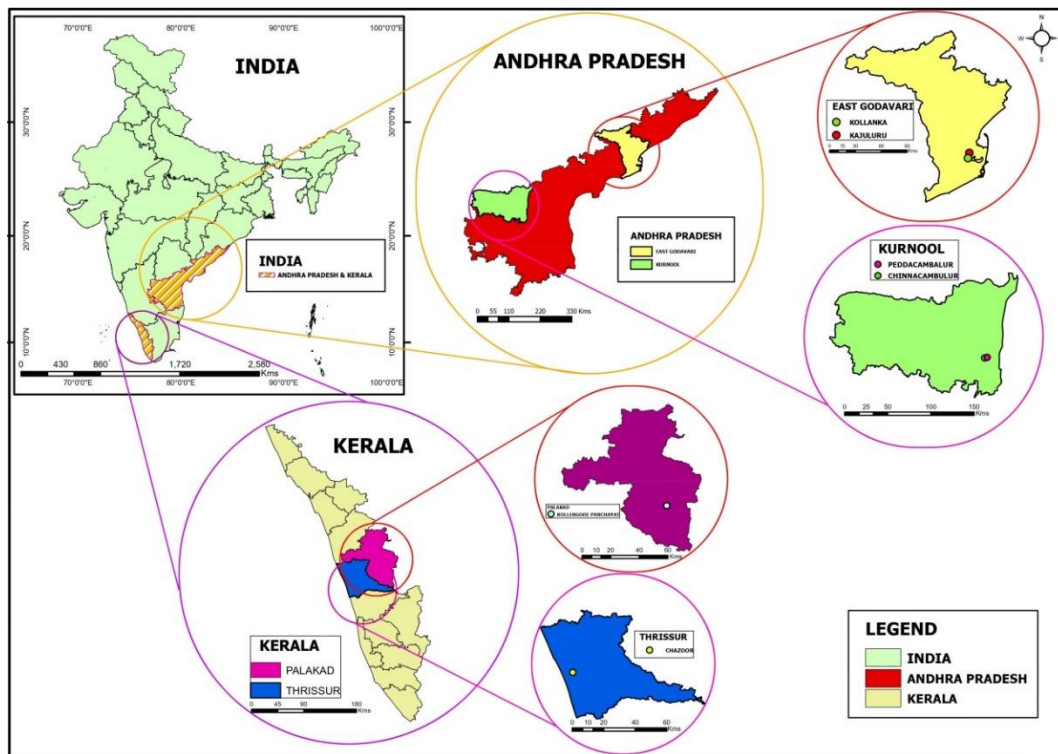


Fig. 1. Map showing the study locations

Table 1. Major actors in the resource networks of paddy farmers in AP and Kerala

State	District	Financial resources*	Seeds*	Other inputs*
AP	Kurnool	Commercial banks (1)	Private dealers (0.57)	Private dealers (0.75)
	East Godavari	Commercial banks (0.57)	Neighbouring farmers (0.52)	Private dealers (1), Cooperatives (1)
Kerala	Palakkad	Commercial (0.96) and co- operative banks (0.96)	Krishi Bhavan (0.87)	Farmer Producer Organisation (FPO) (1)
	Thrissur	Commercial banks (1)	Krishi Bhavan (0.67)	Cooperatives (0.95)

*Eigen centrality values ()

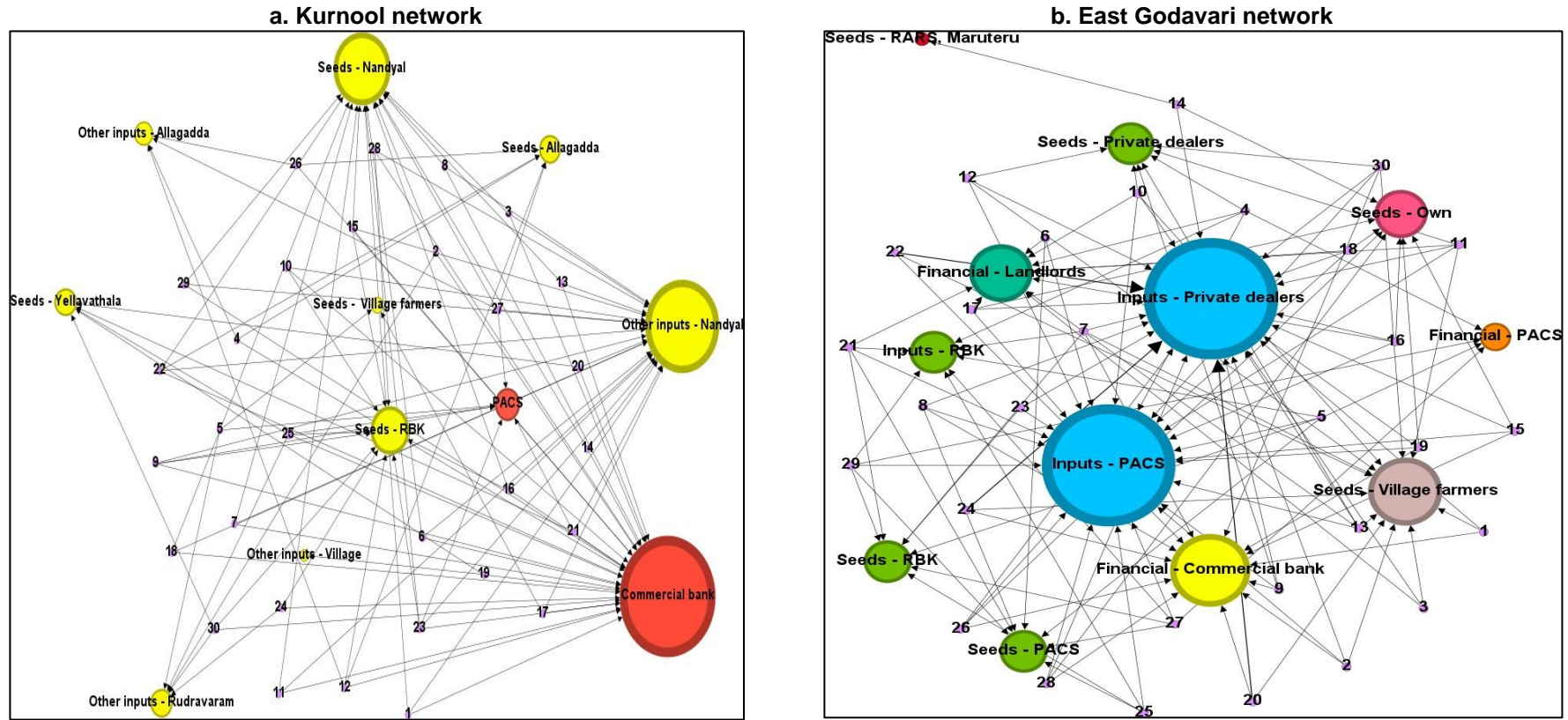


Fig. 2. Resource network maps of rice farmers of AP regions

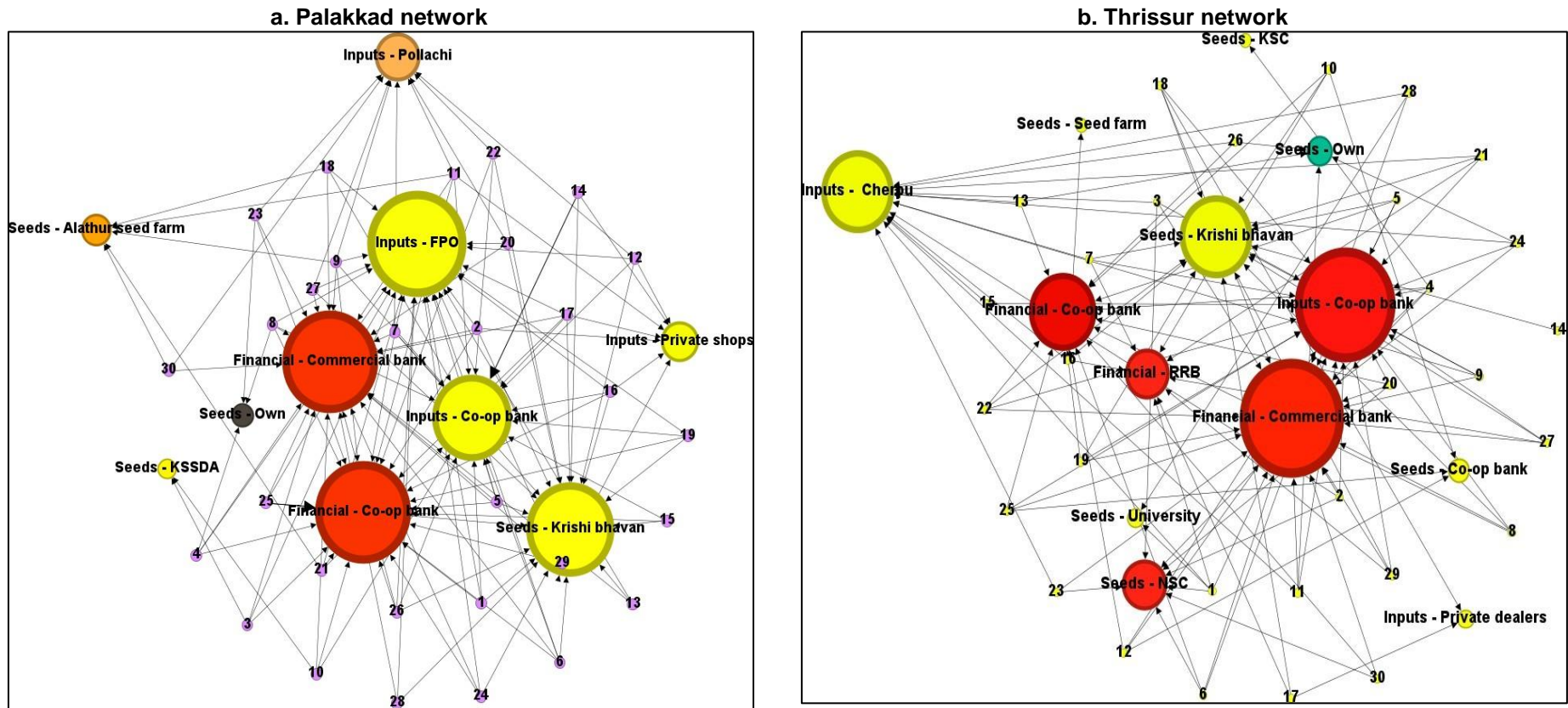


Fig. 3. Resource network maps of rice farmers of Kerala regions

In East Godavari (Fig. 2b), similar to that of Kurnool, commercial banks were the main actors for the financial resources sourcing of farmers with an Eigen centrality value of 0.57. Landlords in the regions were the next major actors with an Eigenvalue of 0.43. Work done by Yamanapalli [7] also reveals that farmers in the Godavari region were sourcing various inputs such as fertilisers, pesticides and seeds from the landlords present in the region. PACS were also present in the network but had relatively lower importance than the other two actors. In the case of seeds, the majority of the farmers are sourcing seeds from the neighbouring farmers (0.52) in the village. Other actors involved in the farmers' seed networks were self-owned seeds, private dealers, RBK and PACS, with all the actors relatively of equal importance with Eigenvalue 0.3. Regional Agricultural Research Station, Maruteru, also played a minor role in the network with a value of 0.04. For sourcing other inputs, the majority of the farmers depended on private dealers and PACS in the region. Both the actors had an Eigenvalue of 1 each, showing their equal and high importance in the network. RBK was also an actor in the supply of other inputs with an Eigenvalue of 0.3.

Further, contrary to the Kurnool network, all the major actors in financial, seeds and other input sourcing of the East Godavari farmers were present within the region itself. PACS in the region with its high prominence as an input-sourcing actor of the farmers, need to further widen its influence into the financial and seed networks of the farmers. The presence of landlords in the financial sourcing network was another point that needed to be emphasised. As a significant amount of the farmers in the region were landless and could not provide collateral security, the institutional sources did not provide them loans. Studies by Revathi [8] and Prasad et al. [9] also revealed the prevalence of pure tenant farmers who do not own any farmland in the East Godavari region. It was in this context, that landlords extended informal loans to farmers, even though at higher interest rates. The importance of these non-institutional sources in such instances was evident in the network map. Non-institutional sources did not emphasize the provision of collateral as security, and the repayment period would also be flexible [10]. Therefore, even if the interest rates charged by them were high, they played a crucial role in the credit sources of farmers.

Fig. 3a shows the resource network map of farmers of the Palakkad region in Kerala. Co-operative banks and commercial banks both were found significant actors in the financial network of farmers of equal importance. The Eigenvalue of both actors was 0.96. In seeds, Krishibhavan played a significant role with an Eigenvalue of 0.87, followed by government seed farm, Alathur (0.22). Own seeds and seeds of Kerala State Seeds Development Authority (KSSDA) also showed a significant role. Work of CV [11] also states that more than 83 per cent of the farmers were sourcing their seeds from Krishi Bhavan, thereby corroborating the results. For other inputs, a Farmer Producer Organisation in the region was the major actor with an Eigenvalue of 1, followed by cooperative banks (0.96) and private dealers (0.3) in the Pollachi district of the neighbouring state of Tamil Nadu.

Thus it could be concluded that the institutional sources, which were considered the most reliable option for sourcing credit, served as the major actors in this region. For seeds, farmers also relied on state-run institutional sources with no private dealers in the network. Regarding other inputs, an FPO, namely, Paddy Farmers Producers Company in the region, was the major actor. The FPO was running an input supply shop along with other agriculture-related activities. Most of the farmers in the region were registered members of this FPO and were utilizing the services of the FPO. This model needs to be replicated in the districts of AP regions where farmers relied on private dealers from other villages and towns. FPO also shared the benefits to its shareholders, further supporting the region's farmers economically.

The resource network map of paddy farmers of the Thrissur district in Kerala is given in Fig. 3b. It could be seen that commercial banks, followed by cooperative cooperatives, were the only actors present in the network with Eigenvalues 1 and 0.62, respectively. With respect to seeds, similar to Palakkad, Krishibhavan was the principal actor, followed by National Seed Corporation (NSC), with Eigenvalues of 0.67 and 0.38, respectively. For other inputs, the majority of the farmers purchased from the co-operative banks, followed by private dealers in Cherpu, a nearby town. The results conclusively proved that institutional sources were the principal actors in all three resource networks of financial, seeds and other inputs in the region.

4. CONCLUSION

The study concluded that commercial banks are the common source of financial resources for farmers in all the districts, with cooperative banks also playing an almost equal role in the Palakkad region. In the seed network, in the case of A.P. districts, private dealers and neighbouring farmers in the regions were the major actors in Kurnool and East Godavari, respectively. While in districts of Kerala, Krishibhavan was the major actor. In networks of other inputs, private dealers were the main actors in the districts of A.P. At the same time, FPOs and cooperatives played major roles in the Palakkad and Thrissur districts, respectively. Overall, while the rice farmers in Kerala regions depended more on the institutional sources for sourcing their inputs which were locally present, the farmers in AP relied more on private dealers who are located in the nearby towns. Given the omnipresence of input dealers in resource networks, capacity building of the dealers through available programmes such as Diploma in Agricultural Extension Services for Input Dealers by MANAGE, Hyderabad, would make them more credible sources for farmers. The results also call for increasing the efficiency of the local institutions such as PACS and RBKs in AP regions in their role as input sources for farmers. Also, a provision for landless farmers who constitute around 8 per cent of the total cultivators in India to avail credit from banks is necessary to reduce their dependence on non-formal sources who charge exorbitant interest rates.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during the writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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