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Farmer-Agribusiness linkage in Andhra Pradesh, India: A case study of hybrid maize *(Zea mays* L.)

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ABSTRACT

The purpose of the study is to assess the farmer agribusiness linkage and the sensitivity and extent of linkage, the farmers linkages are various sectors like output and sevices and to promote technology penetration, improve productivity, enable improved access to inputs and services and increase farmer incomes, thereby strengthening their sustainable agriculture. The data was collected in three major maize growing districts of Andhra Pradesh state *i.e.* Karimnagar, Mahabubnagar and Guntur. Linkage synchronize the starting, stopping, rapidity and quality relevant performance of distinct business processes which take place within farmers. Farmer linkages are with various sectors like input sector which includes seed, fertilizer, pesticides and herbicides are found to be strong. Better market rates are found to be encouraged for the farmers they are comfortable with the existing marketing arrangements if improvisation is there means it facilitates for better realization of prices. Government has been providing price support mechanism to encourage farmers to grow maize as it has ready use in starch and feed meal industries. Financial support is being sought from the traders where as banks are supposed to be a strong link. In the existing scenario, necessary action has to be initiated to safeguard the interest of farmers in obtaining the facility from financial institutes where in the farmer will be benefitted with crop insurance and the applicable loan waivers in case of adverse conditions.

Keywords: Agribusiness linkage, farmers, maize

INTRODUCTION

Agriculture is still an important economic activity (Suman, 2014 and Bharati *et al*,2014) for rural employment, for over 70 percent of the total population in Andhra Pradesh state (Anonymous, 2011). This state situated on the globe in the tropical region between 12°14' and 19°54' North latitudes and 76°46' and 84° 50' East longitudes and is bordered by Maharashtra, Chhattisgarh and Orissa in the north, the Bay of Bengal in the East, Tamil Nadu to the south and Karnataka to the west. There are clear indications that agribusiness linkage having a significant impact on economic development and poverty reduction, in both urban and rural communities. Agro-industries will be sustainable only if they are competitive in terms of costs, prices, operational efficiencies, product offers and other linked parameters and only if the prices they are able to pay farmers are remunerative for those farmers (Patel *et al*., 2014). Maize crop is grown in all the districts of Andhra Pradesh, maize is one of the best crops which requires less water for cultivation and the ease of cultivation has given confidence to farmers across the state (Anonymous, 2012). The top four districts in terms of percentage area of maize contributing to Andhra Pradesh as per the secondary data from DACNET are Karimnagar, Mahabubnagar, Medak and Guntur districts. The first three districts are falling in Telangana Zone where rainfed cropping is observed (Anonymous, 2012). The private sector involvement is a recent development in Indian agriculture. This is apparent in initiatives such as infusion of new technologies like BT cotton, hybrid seed technology in maize, pusa basmati rice, etc., suggesting beneficial outcomes from public sector partnership with the private sector farmer groups and the like. Technology can be the prime mover of agriculture growth in future. Future breakthrough technologies in agriculture could come increasingly from the private sector. Maize is one of the most extensively researched commodities by multinational seed corporations, as it allows increased value capture due to prevalence of

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hybrids. The government has to play a more proactive role as coordinator, facilitator and also as a regulator. Higher investment in basic infrastructure like roads, canal waters, watersheds, check dams, etc. could attract private investment in other areas of the supply chain. Maize *(Zea mays* L.) is the most versatile crop with wider adaptability and yield potential among the food grain crops. It is an important cereal crop in world after wheat and rice. The importance of maize lies in its wide industrial applications besides serving as human food and animal feed. Mostly maize is used in the poultry feed industry (Mogle, 2014 and Singh *et al.*, 2015). Poultry industry is heavily dependent on maize as it forms 50-60 per cent of the input required for broiler feed and 25-35 per cent of the input required for layer feed. Maize is the preferred source of energy in feed when compared with other substitutes due to availability, higher energy and price economics. Poultry feed's share has remained around 45-50 per cent of the total demand for maize in the country over the past 4-5 years. As the demand for maize is growing globally due to its multiple uses for food, feed and industrial sectors, there is need to produce more from same or even less resources. New production technologies offer great promise for increasing productivity to meet the growing demands of consumers (4). The major objective of the study is to elicit issues raised by farmers with respect to the linkages in agribusiness

MATERIALS AND METHODS

The data was collected in three major maize growing districts of Andhra Pradesh state i.e. Karimnagar, Mahabubnagar and Guntur. Karimnagar occupies first place in terms area and production followed by Mahabubnagar and Guntur. In the past decade of years these districts have shown highest production growth rate compared to other maize growing district in the state. Multi stage random sampling is used for primary data collection by selecting 30 farm households, 10 dealers and 5 traders/consolidator/adathias and other intermediaries per district has been selected. Secondary data regarding area, production, productivity and price (mandi/wholesale monthly prices) for each district of Andhra Pradesh has been collected from the sources viz. DACNET, INDIASTAT, AGMARK, Mandi and other online data sources. In order to collect data for the study, sampling framework was decided on the basis of information from secondary sources. For initiating the survey, a random sample is drawn. Interaction with trade i.e. distributors, dealers and retailers at each location where in all the inputs are sold under same hub has been selected similarly experienced traders and progressive farmers were preferred for getting the necessary information suitable for analysis. Multi stage random sampling is used for identifying the districts, and mandals and dealer distributors & traders. For data collection from three districts, a total sample size of 90 farmers, 60 dealers and 15 traders was taken. A total of 18 mandals (blocks) were selected for study purpose. Farmer surveys were conducted in two parts, the first section involved focus group discussions. This section sought to explore the conduct and behavior of maize farmers in the selected mandal. From each mandal, 7 farmers were selected for face-to-face interview. These farmers were canvassed individually in order to collect specific maize production and marketing data from farmers. Similarly data was also collected from dealers on their choices for company, brand, product which they preferred to sell, their point of view about purchasing behavior of a farmers of agriculture inputs for maize cultivation, marketing strategies of companies, challenges in the business and future trend of a maize cultivation in the area. To know the marketing of maize, personal interview of maize traders was also conducted. Qualitative and quantitative data were obtained from primary and secondary data sources. Data were analyzed using SPSS software by preparing frequency tables, descriptive statistics and Garrett scoring technique. Initially farmers were divided into three categories i.e. small, medium and large according to their size of land holding. Then Garrett's ranking technique (Garret *et al.*, 1969) was used to evaluate the preferences of farmers while selecting company's product for sale. In this method, farmers, dealers and distributors were asked to rank the attributes of different inputs according to their importance while making decision to buy the product. The orders of merit given by respondents were converted into percentage position by using the following formula.

$$\text{Percentage Position} = 100 * (R_{ij} - 0.5)/N_j$$

Where
$\mathbf{R}_{ij}$ = Rank given for i^{th} individual
$\mathbf{N}_j$ = Number of items ranked by j^{th} individual

The percentage position of each rank thus obtained was converted into scores by referring to the table given by Henry Garret. Then, for each criterion, the scores of individual respondent were added together and divided by total number of respondents for whom the scores were added. These mean scores for all the criteria were arranged in the order of their ranks and inferences were drawn.

RESULTS AND DISCUSSION

This paper based on the case study conducted on farmer- agribusiness linkage of Andhra Pradesh state in India. The participant farmers in this study supported to identify appropriate maize crop production relevant to their context, provided access to modern technology though farmer- agribusiness linkage and facilitated to access forward linkages with regard to technology for enhanced productivity, value addition of feasible products and market tie up. Study was carried out with 90 farmers in overall sample area comprising of three districts, farmers are classified into three broad categories with a classification of land holding size i.e. small farmers (1-2 Ha) medium farmers (< 10 Ha) and large farmers (>10Ha). The average land holding of the farmers is found to be 1.92 Ha.

Promotional activities followed by companies

Seed Companies compete in doing promotional activities which communicates about their product to the farmers. Major promotion activities that the companies follow are television advertisements, Jeep campaign, pamphlet and field demonstrations (Table 1). Giving advertisements about their product in television is most preferred by the companies. Companies also target on jeep campaign and field demos which takes them directly to the farmer. Companies were promoting their brand or varieties of seeds by hanging boards to the trees at fields and also by painting walls in the villages and fields with the company adds in regional language so that farmers can read with ease and also eye catchy. Companies were mainly conducting demonstration plots as a major promotional activity which takes their brand directly to the farmer field. By organizing demonstration plots in different villages companies are trying to advertise much by showing the benefits at field level and finally to increase their market share.

Table 1: Promotional activities (%) adopted by companies in surveyed districts

District	Promotional activities (%)			
	Television advertise-ments	Jeap cam-paign	Pam-phlet	Field Demon-stration
Guntur	73.0	13.0	4.0	10.0
Karimnagar	73.0	13.0	6.0	8.0
Mahaboobnagar	66.7	10.0	6.7	16.7

Dependence level of farmers for technical support

For technical support during cropping period farmers mainly depend on dealers who are available every time and then agricultural officer and company field officer (Table 2). Dealer gets this information from company officers. Farmers are trustier towards dealers and they followed as advised by the dealers. Farmers depend on commission agent, dealer and trader for price information. If APMC (Agricultural Produce *Marketing* Committee) is in the vicinity farmers get information directly from the APMC (Mangala and Chennappa, 2008). Farmers in the villages which are far away from APMC will get information from other sources like commission agents and dealers with whom farmers will be in regular contact. Of the sample surveyed 35.56% of farmers get information from traders and 27.78% farmers from commission agents and 26.67% farmers from dealers and 10% farmers from APMC.

Table 2: Dependability (%) on services provided by various stake holders in maize growing areas

Service provider	Percentage
Company field officer	4.44
Agriculture officer	28.89
Dealer	65.56
Friends/ Relatives	1.11

Farmers are less dependent on bankers as the service levels are found to be very poor and untimely disbursements of loan and the time lag is found to be high compared to adathias and other intermediaries who are providing financial assistance without documentation and based on the good will of the farmers (Table 3). Moreover they are buying the produce whereas bankers are not providing this facility. Extension agents' support is found to be very poor they appear only at the time of sowing to capture the percent sowing happened with this particular crop.

Table 3: Dependability (%) on services provided by various stake holders in maize growing areas

Service provider	Low	Medium	High
Banker	100	0	0
Agriculture Extension Agent	100	0	0
Dealer	0	68.9	31.1
Company staff	0	54.4	45.6
Adathiya	0	21.1	78.9

Dealers are providing technical support to the farmers when specimens are brought to the counter even though

the satisfaction levels are found to be low as there is no other go for the farmers the dependency levels are signified. Company staff is doing extension work to achieve the set business targets as a part of that they are also providing technical support in case any incidence of pests and diseases or any other problems associated with the seed like germination, poor yields. These findings confirm that resource poor farmers are left out of agricultural development initiatives as revealed by many studies in developing countries (Weatherspoon and Reardon, 2003; Singh, 2002).

Farmer expectations from Government, Companies and Dealers

The following are the expectations of maize farmers (1) Remunerative price and market facilities & information regarding package of practices from government (2) Good hybrids for pest & disease resistance herbicide tolerance and drought tolerance from companies and (3) Timely supply of seeds from dealers.

Types of business owned by dealers

Among the sample surveyed, dealers own their shops as proprietorship and single business (93%) and a few as partnership and multiple business (7%). Out the overall sample 93% of the dealers are dependent only on input business where as 17 % of the dealers have alternate and secondary businesses like commodity trading or cement or some other SME (Small and medium enterprises). Dealers deal with various category products related to agriculture. Of the sample surveyed 93% of dealers deal with pesticides, 73% with fertilizers, 97 % with seed, 7% with feed and 10 % with tools and implements. Dealers are willing to sell more of seed and pesticide which is having more demand and giving more margins. Of different segments dealt by the dealers seed segment gives more turnover followed by pesticides and fertilizers.

Working capital by the dealers in the study area

For working capital dealers invest capital received from financial institutions as loan (49%) and some from their own sources (30%). Dealers purchase seed from companies based on previous season performance of the hybrid. If performance is good it creates demand from the farmer side which pushes dealer to purchase it from the companies to make it available in the market for the farmers. With product performance (53%), dealers also take into consideration brand (30%) and yield (17%).

Creating product awareness

For creating product awareness among farmers self-enquiry is the best way followed by mobile and pamphlet (Fig. 1). Farmers are selective in product choice. Better performance in the previous season creates demand for a particular hybrid from farmers. Along with product choice farmers also particular in brand and few ask for credit. Kalusopa (2005) also studied the challenges of utilizing information communication technologies (ICTs) for the small scale farmers in Zambia.

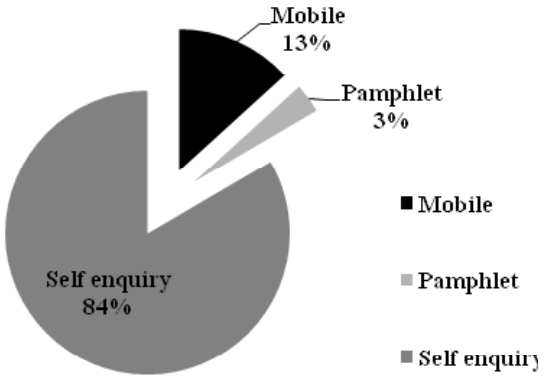

Fig. 1: Creation of product awareness and availability by dealers to farmers

Demand estimation and service provided by dealers

Demand from farmer pushes dealer to get particular hybrid from the company and made it available in the market for next season (Fig. 2). Dealer when purchasing seed from a company also takes into consideration brand value, service they provide and timely supply of seed. Customer retention measures dealers adopt majorly are discount (40%), technical service (20%), credit (17%) and others. The technical services provided by the dealers for pest and diseases are plant protection measures (90%), varietal selection (7%) and fertilizer dosages (3%).

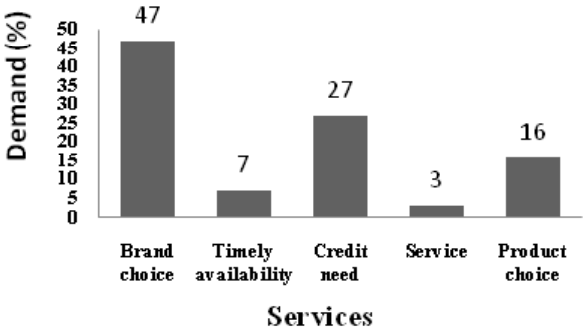

Figure 2: Demand estimation by dealers for seed supply

Challenges faced by dealers

Dealers face a few problems in selling their products. Major problem they face is germination and non

performing products. Due to soil and weather conditions sometimes there may be less germination than given by the company, where farmers come back to dealer and complain about it. Also dealers face problems from credit defaulters and margins from company. Germination problem is observed that few company seeds are not as per the labeled germination percentage due to which additional time and money has to be allocated for gap filling. Scarce resources like labor availability hampers timely gap filing operations. Each seedling usually yields a cob with an average weight of 350g assuming a 10% germination problem leads to a direct loss of one ton in yield. Spurious seed distribution should be curbed to eliminate germination problems. Non performing product sometimes whatever the new molecule that arrives in the market has to be sold in the same geography and if the result is not up to the mark farmers stop coming to the dealer or don't pay the amount willfully. Farmers avail credit from the dealers for cultivation and after encashment of the crop benefits they usually clear the debts. Sometimes due to calamity or when the yields are not good they cannot pay the debts becoming credit defaulter. In few cases they have a habit of changing the dealer as a part of managing the cash, they change the dealer in their subsequent purchases. Due diseases yield loss will be there either this prevails because of bad weather or improper practices. Farmers blame the dealers on the name of spurious seeds sold to him because of which the crop is infested with disease. New entrants on the market provide good margins to the dealers whereas branded companies provide very low margins. Based on this always there is a gap with availability of branded versus non branded seeds. To get branded seeds dealers have to pay cash advances whereas the sale is in credit.

Pre-harvest contract with Farmers

About 13% of the sample shows that there is an existence of pre harvest contract as the traders have satisfied the farmers for obtaining their credit needs. For purchasing maize from the farmers, traders look into various attributes which are critically important. Major consideration is moisture percentage in the seeds, which should be less than 12% and next to it size of grains, color and whether the grains infested with moulds (Fig. 3). Moisture is one of the important factor considered before buying if moisture is not assed properly it's a direct loss in weight apart from that there is a threat of occurrence of moulds and incidence of store grain pests. Grain size is a direct indication for cob filling and immature seed, more the size of the grain more will be the price. Double cob problem was identified in some varieties

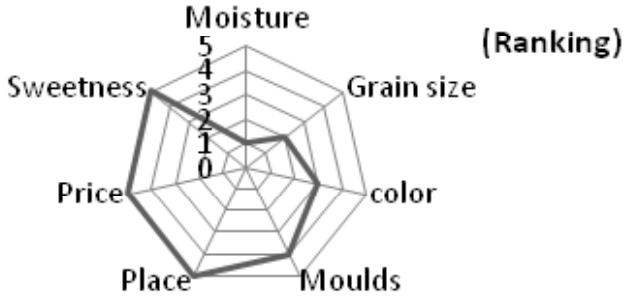

Figure 3: Most important factors that traders look before they buy maize from farmers

and companies should address this issue.

Color is one important attribute which attracts consumer whose preference is for food processing. In case of cob which is grown for edible purpose is again an important factor. European norms don't allow produce which has molds which is an export norm. However, for cattle feed industry molds are not much into consideration. Few place they buy the produce blindly based on the historical transaction and sometimes prices vary with purpose of commodity i.e. food or feed usually feed purpose cost is less. Sweetness considered for food processing purpose.

Criteria followed to purchase maize

Farmers sell their produce to different segments. Major purchaser is poultries followed by feed mills, traders, starch industries and flour mills. Most of the maize is moved to feed industry in which poultry feed is major. Agribusiness has different needs for external support, but in general the higher the quality and reliability of its dealers, the more competitive the enterprise. After selling the produce to traders or other purchasers' farmers realize cash on the same day or in a week. 85% of the farmers realize cash within one week of selling their produce.

Cash realization by farmers

It is found that 12% of the traders are charging 1.75% of the total volume of transaction as commission and 37% of the traders are charging 2%, 25% of the traders are making the transaction on the mandi price in later stages they are selling it either to poultry or feed industry and the same is the case with 12% of the traders they are providing market price and transportation to be paid by the farmer which is not too far i.e. within the radius of 50 Km either to their warehouse of to a nearby poultry. Majority of the traders after purchasing the produce sell to industries without any storage (57%). Traders

store in their own godowns (25%) and private ware house (12%) and leased (6%). Storage is very important to farmer to protect the produce from many stored grain pests and provides a cushion for farmer in selling the produce for low remuneration, scientific storage structure have to be increased in number in order to provide remunerative prices and proper protection for the hard earned produce.

Working capital management

The services by traders were recorded from the opinion of traders. Traders provide service to the farmers and customers in providing credit facilities or providing packing material. Traders also maintain transparency in weighment and provide technical support to customers in order to maintain good relation with them in future. Farmer linkages are with different sectors like Input sector which includes seed, fertilizer, pesticides, herbicides and Output sector which includes feed industry, Human consumption and service sector which includes credit, extension service, ware house, machinery, labor etc. For purchasing the commodity traders mainly approach financial institutions (50%) and capital from friends and family (45%). Labor shortage is one important service segment where delayed farm operations and un-timely operations are leading to reduced yields need of farm machinery in this area is found hence custom hiring for shellers and harvesting machines is one important gap to be filled. Technical services are very essential for farmers when there are inadvertent situations. The dependency for technical support is sought from dealers and company staff hence initiatives from concerned authorities are encouraged.

Strengthening Linkages

The figure 4, below represents the integration of three basic processes-Input, Output and service. Agriculture is dominated by smallholder farmers with limited interaction with both product and input markets**.** Farmer has strong linkages with seed, fertilizer, pesticide, herbicide and fungicide but weak linkage with energy resources. The farmers who were interviewed are very satisfied with their associations with the linked companies and the benefits they were enjoying. In every case the farmers first and foremost appreciated the security that linkage gave them in terms of assured markets, assured prices and assured transparency in all transactions. When it comes to the question of seed there are ample brands available for farmer so his linkage is found to be high he has a choice to choose as per his requirements further the company staff come for demonstrations same is the case with other inputs

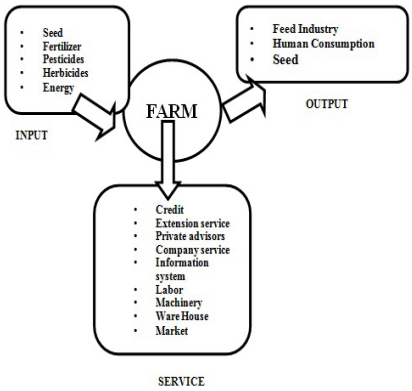

Figure 4: Farmers- Agribusiness linkage

where field demonstrations are quiet common and there are many brands existing for a single molecule. In case of energy there is a provision for farmer where free electricity is supplied provided there should be a structure for provision of electricity meter and service connection i.e. a protected pakka roof from rain water which is possible only to big farmers who could invest so the reach has become poor and the farmers are not able to utilize the facility.

Strengthening linkages is important to elevate awareness of farmers in agribussiness. Successful farmer agribusiness development depends on the role played by the initiator. In generals, linkages are initiated by either a business entity or more traditionally, by a government agency responsible for the development of a particular crop. Farmer has strong linkage with Commission agent and APMC, whereas optimum linkage with bank and weak linkage with storage facilities, extension agent, labor, farm machinery and absolutely no linkage with processing units (Fig. 5). Both farmers and company promoters and others interviewed including banking officers and government officials strongly supported the

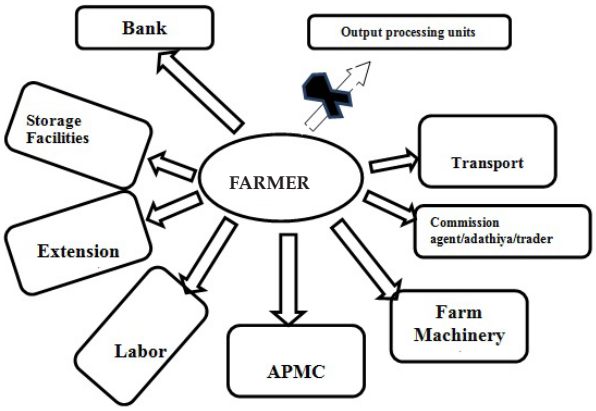

Figure 5: Strengthening of Linkages

need of farmers formal and informal ways. Evidences from Sri Lanka show that the smallholder farmers can benefit from contract farming arrangements with private sector companies (Esham, 2009). Therefore, the government should provide incentives to the private sector to enhance their role as partners in contract farming schemes involving smallholder farmers.

The seed market of maize is confined to few private companies. Hence quality hybrid of maize may be produced by public sector and other companies to offer competitive price with best quality of seeds to the farmers. When it comes to the question of linkages financial support is being sought from the traders where as banks are supposed to be a strong link. In the existing scenario, necessary action has to be initiated to safeguard the interest of farmers in obtaining the facility from financial institutes where in the farmer will be benefitted with crop insurance and the applicable loan waivers in case of adverse conditions. Farmer linkages are with various sectors like input sector which includes seed, fertilizer, pesticides and herbicides are found to be strong but in this case also farmers are availing credit and dependent on dealer recommendations instead of getting a product of his own choice, concerned authorities may be recommended to facilitate un-willful sale to benefit and protect the interest of farmers.

CONCLUSION

As the maize crop is highly suitable to all the agro climatic zones it is observed that there is an increasing trend in Andhra Pradesh. Many promising varieties and hybrids are available with companies like spring sowing varieties, stress tolerant varieties, short duration varieties, lodging resistant varieties, varieties based on the emergence of cob at a particular height. Strong integration with output to feed industries, starch industry and other food industries is required for improving the maize grower community. Market linkage for the backward and forward integration will be ensured with competitive market and leadership role of producers. Energy is one of the weak link as free power is provided for farmers in Andhra Pradesh but timely supply is a concern and further such service connections are provided to farmers who have a roof for provision of electrical meter and pump set because of which most farmers are unable to utilize the facility. Linkage is not at all existing in case of output processing units if at all a scenario of contract farming or co-operative farming exists much more stronger linkages for this particular crop will be established and price realization become satisfactory.

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