Final Report

Innovative Agricultural Input Marketing Models in India: Performance and Potential

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Contents

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Sukhpal Singh

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List of Abbreviations

GAPL	Green Agrevolution Private limited
AMSCs	Agricultural Machinery Service Centres
AP MARKFED	AP Co-operative Marketing Federation
ASCs	Agro service centres
BCMKV	Bhuvi-care Mahindra Krishi Vihar
CI	Cropping intensity
CNH	Class New Holland
COCO	company owned company operated
CS	Choupal Sagar
CSE	Combine Service Enterprise
DAP	Di-Ammonium Phosphate
DSL	DCM Sriram Ltd.
F&F	Farms and Farmers
FIR	First Information Report
FSS	Farmer Service Centre
GCA	Gross Cropped Area
GPS	Global Positioning System
HKB	Hariyali Kissan Bazaar
HLL/HUL	Hindustan Level/Unilever Limited
HP	Horse Power
HPCL	Hindustan Pertoleum Corporation Limited
ICICI	Industrial Credit and Investment Corporation of India
IFFCO	Indian Farmers' Fertiliser Co-operative
ITGIC	IFFCO-Tokyo General Insurance Company
ING	International Netherlands Group
ITC	Indian Tobacco Company
KRIBHCO	Krishak Bharati Co-operative
K3 (KKK)	Khushali Krishi Kendra
KVKs	Krishi Vigyan Kendras
MOP	Muriate of Potash
MSSL	Mahindra Shubhlabh Services Limited
MRP	Maximum Retail Price
NAFED	National Agricultural Co-operative Marketing Federation
NPK	Nitrogen, Phosphorous, and Potash
OBC	Other Backward Class
PACS	Primary Agricultural Co-operative Society
PAU	Punjab Agricultural University
PG	Post Graduate
PGPs	Plant growth promoters
PSFC	Punjab State Farmers Commission

RBH	Rural Business Hub
RBI	Reserve Bank of India
R&D	Research and Development
RKKs	Rallis' Kisan Kendras
SAPPL	Sidhhivinayak Agri Processing Private Limited
SBI	State Bank of India
SC	Scheduled Caste
SKU	Stock Keeping Unit
SRR	Seed Replacement rate
ST	Scheduled Tribe
SMS	Short Message Services
SOPs	Standard Operating Procedures
SP Combine	Self-Propelled Combine harvester
TKK	Tata Kisan Kendra
TKS	Tata Kisan Sansar
TKVK	Tata Kisan Vikas Kendra
UP	Uttar Pradesh
UPL	United Phosphorus Limited
ZFS	Zamindara Farm Solutions

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Executive Summary

Introduction

Agro inputs encompass not only crop related inputs like seed, fertiliser, and crop protection products but also seedlings, feeds, and machines which support crop and allied production. The availability, accessibility, quality and price have been major issue in this sector from the farmer perspective. There are issues of lack of availability of major consumable inputs in adequate quantity on time, reliable quality, especially in seed and crop protection products and feed. This dimension of agribusiness hits the farm production subsector hard as poor input quality and economics compromise the entire agribusiness sector especially farmers and output users whose costs go up and benefit is reduced. But, it is important to recognise that in agribusiness sector, the agro-input sector is the most crucial even to attend to concerns of food quality, food safety, and cost competitiveness. On the other hand, ago-inputs are crucial for small farmers in terms of yield enhancement, cost cutting, and better quality production for better price realization.

In the recent past, there have been many experiments in the ago-input sector in terms of new distribution and marketing channels and some players have attempted to deliver total solutions to farmers including farm and allied inputs. These new channels range from marketers own outlets to supermarkets to franchised outlets besides traditional mainstream channel of selling through distributors and dealers/retailers. The major ones include: ITC's Choupal Sagar, Khushali Krishi Kendras of Hydric, Champion Agro, and Mana Gromor of Coromondal Group. They also operate in/across different states of India. There are also agri start-ups like Green Agrevolution and Zamindara Farm Solutions which also attempt the same objectives for small farmers. Further, there is another parallel trend of custom rentals of farm machinery which started in Punjab during late 2000s and has spread quickly across many villages supported by the state government to cut down cost of cultivation for small

farmers. Besides, there are many private initiatives in this space (custom rental of farm machinery and equipment) where it is being attempted as business model and the only way to promote cost effective mechanisation in smallholder dominated context.

But, there have been no independent studies on the rationale, organisation and performance of the new models in comparison with existing channels with the exception of a few studies on the agricultural machinery rental services provided by PACS in Punjab. The performance of these new channels needs to be assessed in terms of farmer relevance and benefit from an institutional perspective in terms of inclusiveness of and effectiveness for small farmers. Also, most of the documentation on these models is in the form of teaching cases and not research papers or documents.

Objectives

In this context of changing institutional landscape of agro-input marketing and selling, the study:

1. Explores the distribution channels and business models of new (innovative) agro-input players in India as institutional innovations
2. Examines the smallholder inclusiveness of such channels and the nature and the level of effectiveness in helping the farmers access better inputs and services
3. Identifies major issues and challenges in delivery of input services across regions and types of farmers and
4. Examines the possible policy and enabling provisions to promote cost and quality effective agro-input channels.

Methodology

Given that these models and initiatives are state specific in many cases, a checklist of all major players in states i.e. Punjab, UP, Bihar, and AP was prepared. For each type of player in each location, a sample survey of a few retail level functionaries like franchises in agri

machinery rentals in Punjab and GAPL franchises in Bihar was attempted. Further, a farmer level survey of the farmers being serviced by an outlet or retail agency in each case was undertaken to compare and contrast the services offered by traditional channel or two modern channels. In whichever state, more than one new model existed, at least two of them were covered. A set of at least a dozen farmers (covering different sizes) in case of each outlet/local player was covered to assess the impact on the farmers and problems encountered. Thus, 84 farmers in Punjab across PACS and ZFS franchisees, 112 in UP and 95 in Bihar were interviewed which included both modern channel linked as well as non-modern channel linked farmers to compare and contrast the difference in order to see the impact of new channels especially on small farmers and these sub-samples were comprised of various categories of farmers keeping in mind the local farmer population profiles. Thus, across models, states and farmer categories, 6 PACS, 11 franchisees of private players and 291 farmers were interviewed/surveyed. Further, the business and operational aspects of the new channels were understood from interviews with key functionaries which ran for a few hours each besides visits to the outlets and field operations and collection of data from each one of them.

Major findings

The findings are presented in the sections below separately for each state as the type of players, products/services offered and models used differed across the states:

Agri machinery rental services in Punjab

The ZFS franchises were into custom rentals since average of 3 years varying from 1-5 years and two of them were landless while others had medium land holdings with one of them leasing land as well, operating an average of 11 acres most of it owned in most cases. By occupation, they were drivers, or farmers or mechanics. They catered to farmers across as many as 5 villages on an average ranging from 3-8 villages with average farmers served being 56 per year ranging from 10-200. Mostly, booking was done by farmers on phone or by personal visit to the franchisee service provider and mode of payment was cash only which was either paid at the time of booking, or after service delivery or part advance and part after service and only one service provider reporting part credit

provision. Maintenance was not a big issue as it was partly taken care of by franchisor (ZFS) and only partly met by service provider. Two of the five franchisees reported achieving viability while others still have to achieve it. It took 2 and 4 years each to reach viable operations and the other three were either into loss making or just break-even stage. The main reason was that they were either new businesses or had bought some costly machines.

Of the 6 PACS studied, all were on an average working in this activity for 5 years ranging from 4-7 years and mostly started this business during 2007-2010 with majority in the last two years (2009 and 2010) and all have staff which was fulltime which average 2 varying from 1-3. Each one had at least one driver for running the service. The membership of PACS ranged from 477 to 1146 with average of 750 farmer members with only one having less than 400 members. But, only 68% members were active on an average. Of all members, only 10% were making use of rental services ranging from 45-150 members across PACS. Three PACS (50%) had 50-100 members each using the services. Each PACS had one or two tractors with majority having only one on average. A tractor worked for 553 hours on an average ranging from just 40 hours in one case to as many as 1000 hours in another case. Only one PACS had a trailer.

Seed drill was most commonly owned by PACS with some having as many as 4 and on average 2.5 each but it was used for 95 hours per year on an average ranging from 10-240 hours. Since potato was not widely grown the area, potato planter was available with only one PACS and was used for only 60 hours. All these PACS had availed of subsidy from PSFC of the order of 33% on major machines like tractor and equipment like rotavator and laser leveller. Further, some PACS (2) had availed of bank loan to add to their portfolio or buy machines and equipment besides subsidy while others had put their own money into these assets. One of the two had already repaid the bank loan while the other was yet to do so.

Rotavator, laser land leveller and disc harrow emerged as the most hired equipment across all the PACS with two each reporting in each category. The farmers avail of these and other equipments by mostly visiting the PACS centre (reported by 50% PACS) and also by

telephone booking or advance payment booking on first come first serve basis. Payment for the service is generally some advance and some after delivery of service (67% PACS reporting that) followed by only after delivery of service and advance plus part payment after service and part credit.

But, none of the PACS tried borrowing or exchanging machines or equipment across neighbouring PACS. They were also not promoting their services specifically. While four had achieved viability, the two were still to do so. The viability was achieved over 5 years by two of them and over six by another and in just 4 years by one of them. Only two of them faced competition from other players in this service business. The major problems reported in achieving viability in two PACS was delayed payment from farmers and lack of staff to provide the service.

All of them reported serving small farmers with one claiming 100% if its members being small and others 25-99% farmers being small with just one admitting that only less than 25% were small farmers. The surveyed user farmer profile showed that these claims are far from reality in most cases as operated holding are very large on an average. Also, since most hired equipment is laser leveller, rotavator and the like, and general tractor ownedship is on average one, and the tractor is not used that much which should be cause for concern as that is the costliest machine for a farmer.

ZFS franchisee served farmer operated holdings were mostly large and medium accounting for 78% of all farmers. Further, farmers had this land at multiple places with average plots being 2.4 ranging from 1-4. Further, 2/3 of them owned tractors and some had more than one each with some owning cultivator (50%) seed drill, planker and disc harrow (28% each) and two owning combine harvesters (14%). This shows that ZFS caters to both large and small farmers depending on the local area and the franchisee operations. They hired multiple machines ranging from2-10 with most frequent number being 2 and 5 and average being about 5 machines. Combine was used by all of them and tractor by 50% of them for 20-40 hours unlike their ZFS exclusive ones who used it only for less than 20 hours each.

Most of the ZFS franchisee serviced farmers (70%) had semi-medium, medium and large land holding under paddy with only 21% not growing it at all. On the other hand, cotton was grown on much smaller area (semi-medium size) or not grown by a majority of the farmers at all (57%). Wheat was grown by all farmers as it did not compete with other crops in season unlike paddy and cotton competing with each other in the same season. Only three PACS farmers grew potato on a small area of their land ranging from less than 5 acres to 10 acres. Other crops were grown only in less than 5 acres in all categories except in case of one farmer in ZFS plus local service takers and two each in case of PACS and local and only local sources.

ZFS franchisee serviced farmers generally hired one or two machines (64% and 21% each) with a few renting in three machines each. Tractor was the most common hired machine (by 50%) followed by rotavator alone or with tractor i.e. 35% and 28% each respectively. Tractor was hired for less than 20 hours in majority cases.

The ZFS and local custom rental service user farmers were generally smaller than their ZFS counterparts both in owned and operated land on an average which ranged from 2-30 acres and 2-52 acres respectively. They were younger in age, had smaller number of plots of land and lesser ownership of tractors. Though they had smaller cropped area of wheat, paddy and cotton as they had lower operated holdings ,they hired in many more machines and equipment than their ZFS exclusive counter parts .

In general, the PACS service using farmers were medium or large operators with average owned holding of the order of 12 acres and operated size of 19 acres ranging from complete landless and operating just four acres of leased land to as much as 43 acres of owned and 45 acres of operated land. Except one, no one had any other occupation. 41% did not lease in any land and 89% did not lease out any. Only three PACS farmers leased out some land ranging from less than five acres to as much as more than 25 acres. Finally, in terms of operational land categories, only 2 were small and two medium with the rest 85% either medium or large category land operators with as many as up to 5 plots with average being 2.4. The average number of tractors was 1.22 with four farmers not having tractors at all (15% of total). Some of them did not grow paddy and cotton at all and others average of 13

and 4 acres respectively. Every farmer grew wheat and average of 17 acres. Interestingly, on average they hired 3.6 machines from PACS centres and they mostly used non-tractor equipment or tractor with equipment if they did not have tractor followed by laser leveller. Rotavator was the most used equipment and the costliest per hour followed by combine harvester.

96% of the PACS farmers were satisfied with the service with 11% rating it very good and other as good and only one farmer rating it poor. The reason for satisfaction was good availability of service in 93% cases. Earlier , most of them used only local sources and few reporting other means like relatives and other sources with only one reporting PACS as the earlier source as well. Lower cost was a major benefit of the PACS service as it was for local source. Also, availability for infrequent use was a good reason as it would be difficult to buy a machine for infrequent use. Availability and proximity were the major reasons for use of service from PACS and local sources.

As against new service providers, in case of local sources, farmers were also generally smaller landholders or operators than their ZFS counterparts and had this land in just two places on an average. Only two farmers had leased out land and that was in the range of 10-25 acres each. Interestingly, 30% of them did not grow paddy and 50% did not grow cotton while all were growing wheat. They had one tractor with them on an average and hired only two machines each ranging from 2-7 payment was made on delivery of service in majority cases (72%) and on part advance and part on delivery in 21% cases and only one farmer reporting advance and some day's credit. All of the farmers were satisfied with rental services rating it as good (71%) or very good (29%) and it was mainly on availability (79%) as satisfactory or the quality of service (15%) they had rated these service providers. Earlier, these farmers either did not use rental machinery (50%) or used local sources (30%) only or managed through other means (20%).

An examination of the business models of the two custom rentals models of machinery and equipment in Punjab shows that there is plenty of demand for such services from small farmers in general and from other categories of farmers also for some costly machines which cannot be owned at the individual farmer level. The use of PACS has been an

innovative move on the part of the PSFC as it is a local level member based agency which is known for its farmer linkage as it also supplies fertilisers and working capital loans to member farmers. The farmer level analysis of their services across types of farmers – both ZFS, local individual sources, PACS and other combinations shows that across all cases, farmers are generally happy using services though in some cases there are issue of price of service or timely availability as the sowing or harvesting windows are short. However, the inclusiveness of the models –both co-operative and private- is less than desired though Punjab has higher average land holding and more so in cotton belt where the cases studies were carried out.

Agri input supermarket in Uttar Pradesh

An analysis of the K3 supermarket outlets shows that K3 buyers were smaller farmers in general than their non-buying counterparts especially those who exclusively bought from K3. But, on an average, K3 buyers (exclusive) leased in much higher land on an average both in Lakhimpur and Barabanki than their non-K3 counterparts. The average operated land size of K3 non-exclusive buyers in Lakhimpur was as high as 11 acres while those who bought exclusively, it was only 6 acres.

In general, K3 exclusive buyers were less likely to own tractors compared with their K3 buyer counterparts and non-K3 buyers in both the districts but Barabanki, in general, had lower ownership of tractors across all categories compared with those in Lakhimpur. This was also due the fact that land holdings in Barabanki were much smaller than those in Lakhimpur. Of all, only 50% of farmers owned a tractor. Further, more of small and marginal farmers had tractors in Barabanki than in Lakhimpur. Interestingly, a large proportion of farmers reported being members of farmer collectives like PACS or sugarcane societies i.e. 45% of all and it was more the case in Lakhimpur where sugarcane *samitis* are common whereas in Barabanki, it was only PACS which were used by some farmers (10%). Infact, a good proportion of farmers in Lakhimpur were members of both sugarcane *samitis* and PACS.

In general, it was medium category farmers who were aged with average age being 51 years. On the other hand, among non- K3 buyers, it was marginal and small farmers who were older in age on average, especially those in Barabanki than their other counterparts. The Barabanki farmers had higher levels of literacy including in K3 exclusive category and in general there were relatively few graduate and post-graduate farmers and they (graduates and PGs) were mostly in non-buyer or non-exclusive buyer category so far as K3 was concerned.

In cropping pattern, there were clear differences across districts and sets of farmers. Sugarcane was mainly found to be grown in Lakhimpur and accounted for 23% of GCA with K3 exclusive byers putting as much as 50% area under it and other K3 farmers only 19% thus altogether 25% of K3 buyer farmer area being under sugarcane. Compared with this, non-k3 buyers had only 20% area under the crop. Further, in Barabanki, it was a small time crop with only 1% area under it and that too mainly in case of non-K3 buyers who had 4% area under it. The K3 categories did not go for it at all. Overall, 15% of all surveyed farmer GCA was under sugarcane and average was 3.84 acres with those in Lakhimpur having 3.96 acres on an average. In *Kharif*, major crop was paddy across both districts with share of 33% and 36% of GCA in Lakhimpur and Barabanki and 34% of area across districts followed by wheat in *Rabi* which was equally important with 33% and 24% of GCA in Lakhimpur and Barabanki, the overall share of wheat in GCA being 30%. Further, it was exclusive buyers of K3 who grew relatively less paddy, maize and wheat and more of pulses, mustard, menthe (mint), potato and vegetables across both the districts as %age of GCA, which are all high value crops. They were also more into sugarcane compared with their other counterparts in Lakhimpur.

In general, Barabanki had higher cropping intensity than Lakhimpur and further marginal farmers in Lakhimpur had higher cropping intensity than other categories except large ones and in Barabanki, it was not very different across categories. K3 exclusive buyers were less intensive than others and in Barabanki, they were the most intensive cultivators of their land.

It was mostly paddy seed and wheat seed which were bought from the market by all types of farmers and there were no differences across categories or districts. Similarly, all farmers used chemical fertilisers except one in Barabanki. Micro nutrient use was higher among K3 buyers than among non-buyers and lower for *Zaid* crops in Barabanki. PGPs were mostly used in *Rabi* and *Zaid* crops and not much in sugarcane or *Kharif* paddy across categories and districts. Very few farmers bought sugarcane seed while every farmer bought wheat and paddy seed irrespective of farm size category. Chemical pesticides were widely used across crops and seasons and farmer categories except in Rabi where one-third farmers did not use them. Non-K3 buyers especially in Barabanki used much less pesticides. Weedicides were more commonly used in Kharif paddy and Zaid paddy. Fungicides were more common among K3 farmers than among non-K3 farmers but only 1/3 to 50% of farmers across crops and categories used it. It was much less used in sugarcane and wheat. Micronutrients were used more by large and medium farmers in Lakhimpur as well as in Barabanki in wheat and paddy but in sugarcane in Lakhimpur, it was smaller farmers who bought less of micronutrients. PGPs were used more in *Rabi* (wheat) and *Zaid* crops and very few farmers used it in sugarcane and paddy. Only two farmers bought biofertilisers and in Barabanki, none bought biopesticides and even in Lakhimpur, it was only 5% farmers who bought it and all of them were K3 buyers wholly or partly. No non-K3 buyer bought any bio-pesticides.

In general, more of non-K3 farmers bought inputs on cash and more of Barabanki farmers bought them on cash and within the district, it was smaller holders who paid in cash more often. On the other hand, K3 farmers in both districts largely bought it on cash. Most of the K3 farmers bought inputs on cash (83%) across categories and districts. In terms of quality and effectiveness of service by K3 outlets, the shortage of inputs was reported mainly by small, marginal and semi-medium farmers in both districts with 87% farmers reporting it and mainly in chemical fertilisers and to some extent in seed. The major dimension reported was shortage in season. Even in each district, the picture was similar though farmers also reported a combination of inputs for shortage and multiple dimensions for shortage. Further, a higher proportion of non-exclusive buyers reported shortage at K3

outlets though it was mainly seasonal shortage and mainly of fertilisers and seeds to some extent.

There was no interlocking of markets in case of K3, as it was not into output buying or credit sales. Even non-K3 buyers did not report any compulsion to sell produce to the input/credit provider. All respondents were satisfied with qualification required to provide agricultural advice. All of them also were given receipt for their purchase from K3. But, 85% of the farmers did not know the company behind the K3 brand of stores. More of the non-exclusive buyers were not aware of the company behind K3 outlets.

Only 17% of the K3 farmers reported some decline in cost of production due to extension provided by K3 staff but it was not specific to those who bought exclusively from K3 stores. Further, in majority cases, the cost reduction was only upto 15% compared with earlier costs. Further, it was small and medium farmers who found this reduction in their costs of production and not large or marginal farmers. Of the total sample, only 10% reported the cost of production decline lower than 15% with 5% reporting it to be 15-30% cost reduction. Major reason for this cost reduction was proper utilisation of various resources especially in case of small farmers in Barabanki. Further, the cost reduction due to better utilisation of resources was more appreciated by non-exclusive farmers. 1/3 of the farmers also reported receiving help from K3 staff on selection of crops with small and marginal in Lakhimpur and medium and semi-medium in Barabanki even going upto 40-60% of the total in their category. More of non-exclusive buyers appreciated this help in crop selection than the exclusive buyers. More interesting was the farmer response on increase in yield due to K3 help which was recognised by 91% of farmers going up to 95% in Lakhimpur and more so in case of small, semi-medium and medium categories farmers across the two districts. 40% farmers each reported yield increase of upto 15% and 15-30% each and 10% even as much as more than 45% increase in their crop yields. Further, it was non-exclusive farmers who reported these yield increases in large proportions. The yield increase was attributed to better seeds, better chemicals and better fertilisers and a combination of these factors in most cases. Here again, non-exclusive buyers reported these

factors much more perhaps due to the fact that they were able to compare K3 inputs with other source inputs as they were using both.

Thus, the K3 outlets were inclusive of small farmers and were more inclusive than traditional channels and helped farmers achieve higher yield, lower costs of production and better resource management though they were still plagued by shortage of fertilisers as there is government allocation of fertilisers every season. But, still the K3 stores need to do better to get more loyalty which was limited only to a small percentage of buyers right now. This could be partly due to implicit interlinking of credit and input markets and partly due to lack of output linkage with farmers which takes them to other channels. The success of K3 in the state where larger players like HKB and TKB failed is interesting and has lessons for making such chain stores viable by keeping costs low and focus on farm inputs and services with sustained scale up.

Franchising in Bihar

Green Agrevolution Private Limited (GAPL) as an agribusiness start up to facilitate farmers with better inputs and extension and markets in Bihar used franchising model under which it ran 11 outlets/centres called Dehaat across four districts which catered to a total of 4000 farmer members (who paid Rs. 200 annually each) with each in a 10-12 km. radius covering 15-20 villages each with services like soil sample analysis, crop selection, and technical support during the season and marketing of produce. All 11 Dehaat centres in 2013-14 were franchises with GAPL. Each franchisee ran only one Dehaat or outlet. Most of the Dehaat centers were operated from the franchisee's own premises to cut the cost. A basic criterion for every Dehaat was to cover upto 500 farmers around it but the area and number of villages varied according to the density of population. The head office fixed the prices for all Dehaats. Farmers demanded quality products and those were supplied accordingly though GAPL also promoted better quality products proactively. Each Dehaat was visited weekly by a coordinator who also participated in farmers meets and visited farmers when there was a problem. There was a product exchange and movement across Dehaats when there was shortage in some of them. The promotion was carried out by the Dehaat operator and also by word of mouth by farmers who were already members of the Dehaat.

GAPL went in for franchisee model as against COCO model as after two years of operations, it found that it could not reach all farmers on its own. Even though its Dehaats were lower cost, it believed that outsiders could not do good business in rural areas. Local people trust only locals and employee mentality would not work in such situations especially if it has to manage lower cost operations and still make impact and be viable. It earns less but also has less trouble due to franchisees. Scalability was an issue but training Dehaat operators and sharing profits with them was desirable. It also bought back non-chemical produce like water lemon from farmers and sold in local market GAPL paid a small premium for non-chemical produce which was bought without any contract with growers. It also promoted and bought a new paddy variety with buy back arrangement. It supplied grain produce to processors like Godrej for feed (maize) and to some exporters. The prices paid to farmers were *mandi* price based. Farmers wanted more of input services than output services from the agency. It sold only on cash to farmers though there was a need for financial linkage as farmers were not able to buy on cash from Dehaat. It had Nectar brand being used to sell honey and *makhan*a (fox nut).

It recognized that variety of inputs needs to be increased for scale up and higher market share. It is of the view that it needs to attract more corporates for better viability. Small farmers, cropping pattern and low market potential for high value crops must be reasons for corporates not being interested in this area or state.

Each Dehaat covered many villages like Vaishali caters to 93 villages though many of these were local settlements, not revenue villages. Each village had 15-25 Dehaat farmers on an average but some villages had only 5-6 farmers each. But, some villages had many dozen Dehaat farmers each. There were some minimum conditions to become a franchisee like integrity and commitment besides capability to run it.

Most of the Dehaat franchises were set up in 2013 or 2014 with only one being from 2011. The franchisees were fairly educated with graduate or post-graduation in majority cases and all had attended one week Dehaat training to begin with. All of them were landowners and

operators and had tubewell owned in most cases except one. Only two had tractors. Though they grew predominantly wheat and paddy but some of them did grow new and high value crops like green gram, maize, potato and other vegetables. Depending on the location and the year of start, the turnover varied from a low of less than Rs. two lakh to as much as Rs. 30 lakh per annum and this was directly proportionate to the number of villages and farmers catered to by the franchisees and those buying inputs. Further, all of them had purchased output and had bought 1-3 crops each either directly purchasing or under a contract farming arrangement for the franchisor who in turn sold it to the ultimate buyer. All provided advice on use of fertilizers/crop protection/agri machinery, field demo/trails of farm inputs, information about innovative/improved methods of agricultural practices, information about government schemes (subsidies), technology, information about output price and Marketing/sales support for output and only one had taken farmers for exhibition visit/agricultural fair.

The farmers in Bihar are generally smallholders by and large with 92% operating less than 2 hectares. But, Dehaat farmers in general were larger than their non-Dehaat counterparts both in owned and operated land holdings. Whereas overall owned land on an average was 3.33 acres, it was 3.71 acres for Dehaat buyers and 2.78 acres in case of non-Dehaat farmers. Further across districts, it was 3.48 acres for Dehaat versus 2.63 acres for non-Dehaat in Muzaffarpur and in Vaishali, it was 3.98 acres versus 2.96 acres respectively. Operated holdings came out to be 3.63 acres on an average but 3.89 acres and 3.27 acres for Dehaat and non-Dehaat categories respectably. In general, Dehaat farmers cultivated more area under high value crops like fruits, vegetables, potato and maize than their non-Dehaat counterparts. The Dehaat farmers were generally more literate than their non-Dehaat counterparts, some being graduates and postgraduates. But, this was not true across categories of farmers in terms of land holding. Dehaat farmers had lower cropping intensity than the non-Dehaat counterparts across both districts. One reason for this could be the higher area under fruit crops which were perennial or annual crops.

But, across both categories, marginal and small farmers had a higher cropping intensity than that of other categories. In wheat and paddy, all farmers had bought seeds from the

market in both districts and across Dehaat and non-Dehaat categories. Across districts, it was more in Vaishali and that too, more of Dehaat buyers, almost all of whom had bought whereas only a small percentage of the non-Dehaat (22%) had done so. Chemical fertilisers were also widely used by all Dehaat farmers and all but 8% of the non-Dehaat farmers across crop seasons. A somewhat higher proportion of Dehaat farmers reported buying biofertilisers than their non-Dehaat counterparts which went upto 8% in Rabi season. PGPs were bought and used only by Dehaat farmers. Only 13% and 19% farmers bought bio-fertilizers for Kharif and Rabi seasons respectively. In Muzaffarpur, farmers used bio-fertilizers more for Rabi crops whereas it was equal in Vaishali. Only 6% farmers used bio-fertilizers for *zaid* crops and most of them were found in Vaishali. Landholding had an effect on purchase of bio-fertilizers in Vaishali only.

A higher number of Dehaat farmers bought chemical pesticides in all seasons across both the districts except in case of *Zaid Moong* in Muzaffarpur where an equal number of Dehaat and non-Dehaat farmers were inclined towards the use of chemical pesticides. Almost similar trends were found in case of purchase of weedicides/herbicides. Of those farmers who used fungicides, most of them were Dehaat farmers. Similarly only 10-15% of the farmers applied bio-pesticides in both the seasons across both districts. Interestingly, all non-Dehaat farmers for all crops across both the districts did not use bio-pesticides.

About 40% of the farmers had a membership of a Dehaat farmer group and a large proportion of that was composed of marginal and small farmers. More than three times of those in Muzaffarpur (20%). had membership in Vaishali (61%). However, in both the districts, semi-medium farmers were the least interested in Dehaat farmer group membership. More of marginal farmers in Muzaffarpur were members of this group whereas in Vaishali, small farmers had a higher membership rate.

About 60% of Dehaat farmers bought using both cash and credit and most of them were marginal and small farmers. Only 10% of the farmers faced shortage of agri-inputs at Dehaat and the major shortage was of seeds. However, the instances of shortage were relatively more in Vaishali than in Muzaffarpur. More than 80% of the Dehaat farmers in

both the districts were aware of the company behind Dehaat. Of those who knew, 46% visited the Dehaat outlets. However, this prevalence was higher among non-Dehaat farmers in Vaishali. Among those who knew about Dehaat, the most frequent were marginal farmers followed by small and medium holders in both the districts. However, of those who visited the Dehaat, small holders were more prominent than marginal and semi-medium holders across both districts and of those who visited, about one-third farmers found the Dehaat products as spurious and this observation was higher among Vaishali farmers than Muzaffarpur ones. About 10-16% farmers across both the districts, could not find the products they visited for. About 43% of the farmers had their soil tested with the Dehaat farmers more inclined towards soil testing across both the districts.

Very few farmers (9%) reported decline in the cost of cultivation due to the Dehaat extension. But, 92% farmers reported an increase in yield. About one-fifth of the farmers in both the districts confirmed that Dehaat could help them in crop selection and this help worked more in case of Kharif crop selection. About one-third of the farmers attended training by F&F and it was more about Kharif crops. Small farmers were the largest group to receive the training followed by semi-medium and marginal farmers. About 42% of the Dehaat farmers received marketing/sales support from Dehaat with small holders being the largest group followed by marginal and semi-medium (in equal numbers). In both the districts, small holders formed the largest group enjoying that support. For more than 60% of the farmers in both the districts, seeds remained the prime attraction.

The above summary of findings of franchise operations and their farmer level impact shows that the franchise model is working but needs improvement for more effective farmer level impacts especially on small farmer livelihoods. It needs to be more inclusive of small and marginal land operators to make a difference to the local agricultural conditions. The extension contribution of Dehaat is noteworthy as extension is more by default than by design in mainstream agri input marketing channels. On the other hand, in the context of abolition of APMC Act in the state, Dehaat is making an important contribution by facilitating a new and more direct market linkage for small farmers in new and high value crops which need prompt handling.

Policy implications

It is interesting to note that agri machinery rental services are already attracting attention of policy makers given their relevance in smallholder farming context. But, in custom hiring, there is a need to encourage this practice across all states and regions with proper incentivisation of service for providers as it is the most effective way of cutting down cost of farm production and making operations more efficient and, therefore, increase yields as well. But, most of the operators were found to be not so inclusive of the small farmers despite all the claims being made. Of course, the landholdings in the study area are somewhat large but still, it is important to focus on small landowners and operators. There should also be rationalisation of equipment keeping in mind the local needs of small farmers. Further, more services could be added or local machine owners could be encouraged to deposit their machines to such centers for their use when idle to cope up with the shortage of certain machines in peak demand season. The state support for co-operatives as has happened in Punjab needs to be replicated elsewhere and private agri starts ups in this space needs to be encouraged with softer loans by bringing them under priority sector lending for longer term loans. The use of franchising is an ideal way for agri startups and others to scale up this model as this cannot be delivered from a centralised place beyond a scale. Innovations attempting more relevant machines and equipments for such purposes need to be encouraged. Infact, schemes to promote mechanisation in farm sector for new crops like cotton and sugarcane need to keep this model in view as those machines are very costly for individual farmers to own, and make it more inclusive by involving local youth and landless or marginal farmers and professionals. The example of professional custom hiring combine operators in Maharashtra and Gujarat need to be followed.

So far as role of modern supermarket chain stores for farm input and service retailing is concerned, the K3 case study shows that it is possible to provide supermarket type provision of farm retail by managing to keep fixed costs low and yet be inclusive by reaching small farmers effectively if the players are innovative enough. The case of public

private partnership achieved by Hydric shows that it is possible to mobilise infrastructure to deliver farm services at the local level and yet be inclusive if there is cost control in fixed and operational terms. The leasing in of facilities by the company made a huge difference to the cost of operations and yet brought it close to farmers as there was focus on delivery and extension and not on creating a high end store or facility unlike the previous players who failed.

The operations across the UP state which has still not carried out any agri market reforms shows that focus on farm input supply itself can be quite significant for farmers in improving their livelihoods as it can cut down the cost and improve yields. The sustained presence of the K3 chain of stores over the last decade shows that it is important to stick on to make inroads for farm service delivery as there are issues of interlocked markets and such other structural barriers. There is a need to encourage such supermarket initiatives if they can promise to proactively target and reach small and marginal farmers. The improved access to institutional finance for small farmers can give a further flip to the modern supermarket based farm service and input retail in India.

The functioning of the Dehaat centres and the farmer uptake of it shows that new channels can lead to more informed farmer level input use and realization of higher prices in small holder context. However, the project was not particularly inclusive of small holders. But, as revealed by GAPL case study, the shortage of capital to scale up such innovative initiatives remains an issue. It is here that the role of investment support for agri startups is needed and the start up fund can be channelized to such innovative agencies. Further, as has been done by the MoA recently where it is made mandatory to have a degree in agricultural sciences to obtain a farm input distribution license, such agencies can fill the space and step in larger numbers to provide more effective and timely extension backed by farm input supply and output handling services.

Further, large agri input agencies can be encouraged to work with such small scale yet promising players to give them support in distribution and new product handling as they have more qualified staff and can educate farmers about new products adequately. Further, input subsidy should be delinked from input sale and rather be given for creation of market

for more sustainable farm input products so that marketing and selling pressures do not come in the way of creation of markets for new products for sustainability.

Another inference from the Bihar case study is that despite all the failures of many large scale agencies in delivering total solutions to farmers, the objective remains important and it is crucial to find new ways of meeting this need as it is only through market oriented farm production and its handling that small holders can stay put in and earn a decent livelihood from farming. On the other hand, producers' agencies are important to work with such initiatives to lower cost of operations and get a win win situation for all involved. Such players can leverage the government schemes for such producer collectivization and handholding for some time. Producer agencies should also look for such roles in the interest of their members or undertake such services on their own with public policy support.

Chapter 1

Introduction

1.1 Background and Context

The low yields, increasing costs of cultivation, and the low price realisation due to lack of modernization of small holder developing country agriculture has been an important issue for all stakeholders including private corporate sector involved in marketing of agricultural inputs to farmers and buying farm produce from them. Small farmers in India are in dire stress due to low farm yields, increasing cost of cultivation, unstable market prices and lack of various other support mechanisms. The only a few ways to help such farmers is to either help cut down their costs of production and marketing, provide stable and remunerable market access and improve price realisation or increase yields. Therefore, there is a role for innovations, institutions, and institutional innovations in achieving inclusive agricultural development in a context like that of Indian agriculture.

Institutions and institutional context are important determinants of development. There are various terms and concepts used to refer to this in literature e.g. institutions, institutional framework, institutional environment, institutional capacity, institutional arrangements and institutional mechanisms. Institutions also refer to 'rules of the game' in a society or more formally, the humanly designed constraints that shape human interaction. They are made up of formal constraints like rules and laws, informal constraints like norms of behaviour or codes of conduct, and their enforcement characteristics and they altogether define the incentive structure of the societies and, more so, economies. Institutions are also different from organisations – the former being the rules of the game and the latter the players in the game. But, both of them influence each other in terms of which organisations come up and how they evolve is determined by the institutional framework (rules of the game) and they in turn influence how the institutional framework itself evolves. Further, the institutional economics also differentiates between institutional environment and institutional mechanisms or arrangements. The former refers to the fundamental political, social, and legal ground rules that establish the basis for production, trade/exchange and distribution and the latter are arrangements between and among economic units that govern the ways in which these units can compete and/or co-operate. These institutions are further embedded

in local social and cultural systems which leads to 'institutional thickness' which refers to dense presence of organisations in a local area, their strong interactions in local area, their domination due to this high level of interaction and shared commitment to a common cause, though all of this need not be formal. This relationship between regional institutions and local economic development led to the realisation that there is a need for policy and public institutions to facilitate a common context of co-ordination (Neilson and Pritchard, 2009).

"Innovation is the implementation of something new or improved (whether technology or otherwise) in products (goods or services), processes, marketing or organizational methods. In other words, it means applying ideas, knowledge or practices that are new to a particular context with the purpose of creating positive change that will provide a way to meet needs, take on challenges or seize opportunities. Such novelties and useful changes could be substantial (a large change or improvement) or cumulative (small changes that together produce a significant improvement)" (IICA, 2014, p.3). A novel idea implemented in a particular way can be considered an innovation if it is new in the context, even though it may not be new to the world (IICA, 2014, p.3).

There are many types of innovations like technological, social, or product, process, marketing and organizational and institutional innovation is one type (IICA, 2014). Institutions include both organisations and institutions and formal and informal 'rules of the game'. Institutions shape human interactions and, therefore, efficiency and productivity, and institutional innovations drive development. There could be path dependence in institutions versus innovations in institutions. Institutional innovations could be in land system, labour system, social systems and organisation of activity-production and marketing, including market and policy reforms and innovations could take place in a top down or bottom up manner. Institutional innovations entails a change of policies, standards, regulations, processes, agreements, models, ways of organizing, institutional practices, or relationships with other organizations, so as to create a more dynamic environment that encourages improvements in the performance of an institution or system to make it more interactive and competitive (IICA, 2014, p.4).

Major concerns in institutional innovations include: they generally take place outside the formal system to begin with, there is very little policy support before proven, market, social, or environmental entrepreneurship driven innovations, exclusion from and inclusion in institutional innovation which depends on type of crop, place, technology, market, and/or type and nature of organization of activity, and sustainability, and scale up of such innovations. On the other hand, barriers to such innovations can include: *Infrastructural barriers*, relating to the knowledge infrastructure made up by departments of R&D, universities, research centres and all related regulations, and the physical infrastructure, consisting principally of roads and telecommunications; *hard and soft institutional barriers*, relating to formal rules and regulations (hard), and relating to symbols, values and norms (soft); n*etwork barriers*, calibrated by strength of connectivity, whereby strong interactions cause blindness towards new ideas from outside and weak interactions hinder actors from combining their forces to work for change; and *market structure barriers*, relating to the position of and relations between market parties along the value chain (Totin et al, 2012). That institutional innovations contribute to agricultural development is well known as illustrated by Ruttan (1989) in the nature of interaction of institutions with technology, resource endowments, and cultural endowments which also influence institutional innovations and change in multiple ways.

Agro inputs encompass not only crop related inputs like seed, fertiliser, and crop protection products but also seedlings, feeds, and machines which support crop and allied production. The availability, accessibility, quality and price have been major issue in this sector from the farmer perspective. There are issues of lack of availability of major consumable inputs in adequate quantity on time, reliable quality or spurious products especially in seed and crop protection products and feed. This dimension of agribusiness hits the farm production subsector hard as poor input quality and economics compromise the entire agribusiness sector especially farmers and output users whose costs go up and benefit is reduced. But, it is important to recognise that in agribusiness sector the agro-input sector is the most crucial even to attend to concerns of food quality, food safety, and cost competitiveness. On the other hand, ago-inputs are crucial for small farmers in terms of yield enhancement, cost

cutting, and better quality production for better price realization. There are reported to be 282000 farm input retailers in India (Kaegi, 2015) but the issues of availability in terms of time and quality still remain across inputs.

In the recent past, there have been many experiments in the ago-input sector in terms of new distribution and marketing channels and some players have attempted to deliver total solutions to farmers including farm and allied inputs. These new channels range from marketers own outlets to supermarkets to franchised outlets besides traditional mainstream channel of selling through distributors and dealers/retailers. The major ones include: DCM Sriram Limited (DSL)'s Hariyali Kissan Bazaar (HKB), ITC's Choupal Sagar, Triveni Khushhali Bazar, Khushali Krishi Kendras, Champion Agro, Future's Aadhaar, and Mana Gromor of Coromondal Group. They also operate in/across different states of India. There are also agri start-ups like Farms and farmers and its agribusiness arm- Green Agrevolution Pvt. Ltd. (GAPL) and Zamindara Farm Solutions (ZFS) which also attempt same objectives for small farmers.

The earliest and the biggest presence was that of DSL's HKB outlets since 2004 which expanded to 300 hundred outlets across states only to be shut down after a few years of large scale operations in 2013-14 due to lack of viable operations (Kaegi, 2015). It was a Company Owned –Company Operated (COCO) stores model. Similarly, Aadhaar outlets of Godrej which were also COCO outlets could not deal with farm inputs viably and had to be restructured to a franchise model dropping farm input portfolio altogether and becoming a rural supermarket. The fate of Triveni Khushali Bazaar outlets was no different and the company withdrew operations after a few years. "Viswas" is the rural retail chain set up by Viswas Business Synergy Ltd through its partner-Papillion Market Innovators Ltd- both based in Hyderabad. They started in AP in 2005 and had rolled out some 330 small shops/stores by mid 2010 and had 166 stores in AP and several in other southern states. They started by selling fertilizers, pesticides, seeds, and some small equipment, and selling well-known brands (one is Coromandel's Gromor; Coromandel also has its own rural business hub (RBH) chain called Mana Gromor). They report providing technical assistance to farmers, as well as having various financial services (credit cards and home

loans) and insurance activities (selling insurance for ICICI and MetLife India) (Rao, et al, 2011). The Mana Gromor of Coromondel chain has more than 600 COCO outlets in AP and neighbouring states. There are reports of a few more private companies trying their hand at farm input retail with modern formats.

But, there have been no independent studies on the rationale, organisation and performance of the new models in comparison with existing channels. The performance of these new channels especially needs to be assessed in terms of farmer relevance and benefit. Also, most of the documentation on these models is in the form of teaching cases (e.g. Bell et al, 2008), and not research papers or documents.

Further, there is another parallel trend of custom rentals of farm machinery which started in Punjab in late 2000s and has spread quickly across many villages supported by the state government to cut down cost of cultivation for small farmers. Besides, there are many private initiatives in this space where it is being attempted as business model and the only way to promote cost effective mechanisation in smallholder dominated context. In some cases, farmer producer companies (new generation co-operatives or co-operative companies) have also undertaken custom rentals of farm machinery and equipment (SFAC, 2013).

There have been studies of custom rentals of combine harvesters in India (Singh, 2010) and China (Yang et al, 2013) wherein both individual entrepreneurs in India and co-operatives in China provide rental services of combine harvesting across states in each country. China where the average farm size is only 0.34 acres, lease of land to farmers by state is for 30 years and where only 5% farm power was animal based (as against 9% in India), the custom hiring farmer co-operative companies operate across provinces with one Combine Service Enterprise (CSE) harvesting 200 farms or 133 hacs or two farms/day with 100 days of work. These co-operatives adopt a strategy to not compete with each other and access lower cost spare parts together for a group of 5-10 CSEs who are part of the co-operative. These are all private initiatives initially supported by the state with harvest calendars across regions which overtime has been managed by the CSEs themselves with own experience

across provinces (Yang et al, 2013). But, in India, the phenomenon of institutional innovation in machinery rentals space has not been adequately studied except a few studies in the context of Punjab which are on the functioning of the PACS undertaking this service at the local level (Sidhu and Vatta, 2012; Singh et al, 2013). Similar is the case of other two innovations i.e. franchising and modern rural supermarkets so far as status of research is concerned.

1.2 Objectives

In this context of changing landscape of agro-input marketing and selling, the study:

1. Explores the distribution channels and business models of new (innovative) agro-input players in India
2. Examines the small holder inclusiveness of such channels and the nature and the level of effectiveness in helping the farmers access better inputs and services
3. Identifies major issues and challenges in delivery of input services across regions and types of farmers and
4. Examines the possible policy and enabling provisions to promote cost and quality effective agro-input channels.

1.3 Methodology

The study was initiated with review of any relevant literature on the subject and secondary data analysis. A list of major innovative players in agro input domain was prepared based on the new channels or other innovations they had attempted. This included all the major rural supermarkets, franchising based enterprises or other innovative models like PACS in Punjab. Then, the companies/agencies running these models were approached and interviewed for understanding the logic of their operations and business models. One of the major players (company owned supermarket retailer run by an agro input firm) refused to participate in the study while another small one (Godrej's Aadhaar) changed its track by the time study was designed. Thus, only one supermarket chain- Khushali Krishi Kendras- in UP was left for us to study. Further, given that these models and initiatives are state specific in many cases, a checklist of all major players in states like Punjab, UP, Bihar, and AP was prepared. For each type of player in each location, a sample survey of a few outlet level functionaries like franchises in agri machinery rental in Punjab and Green Agrevolution's

franchises in Bihar was done. Further, a survey of the farmers being serviced by an outlet in each case was undertaken to compare and contrast the services offered by traditional channel or two modern channels. In whichever state, more than one new model existed, at least two of them were covered e.g. in Punjab where both PACS and ZFS doing custom rentals of farm machinery were studied. A set of at least a dozen farmers (covering different sizes) in case of each outlet/local player was covered to assess the impact on the farmers and problems encountered. A similar set of non-innovative channel farmers was interviewed as control farmers to observe the difference between modern and traditional channel. Thus, we had a sample size of interviewed farmers reaching a size of 84 in Punjab across PACS, ZFS franchisees, and local service providers, the last one as control group, 112 in UP and 95 in Bihar which included both modern channel linked as well non-modern channel linked farmers to compare and contrast the difference in order to see the impact of new channels especially on small farmers and these sub-samples were comprised of various categories of farmers keeping in mind the local farmer population profiles. Thus, across models, states and farmer categories, we interviewed- 6 PACS, 11 franchisees and 291 farmers (table 1.1). The reference period of the study was 2013-14 for Punjab and 2014-15 for UP and Bihar as well as past one or two years (2011-12 and 12-13) for farmer perspective and experience and upto 5 years in the past for the purpose of understanding the rationale and performance of the models.

Table 1.1: Distribution of Sample interviewees for case studies

State	**Agency**	**Franchisees/PACS interviews**	**Farmer interviews** *Modern Channel*	*Control*
Punjab	ZFS	5	14	
	ZFS & Local	0	17	
	PACS	6	0	
	PACS & Local	0	27	
	Only local	0		26
UP	Hydric's KKK	0	70	42
Bihar	F&F (GAPL)'s Dehaat	5	51	44
All		16	179	112

Total farmers: 291

1.4 Chapterisation

The second chapter reviews the major aspects of agri input market in India from a buyer perspective and identifies the gaps based on empirical studies across states and players including modern rural supermarkets. This is followed by chapter three which examines the custom rentals of farm machinery in Punjab comparing the well established PACS based agro machinery service centres with private company driven franchisee system (ZFS) as business model. The nature and dynamics of the two systems are examined and then the effectiveness of both assessed based on a user and non-user farmer survey based findings. The fourth chapter examines the business model of a local farm input supermarket chain (K3) in UP which has been able to grow and sustain and scale up in its business over the last 10 years and has done so where others have failed. Its effectiveness is examined with the help of data from a survey of its users and non-users across two districts and categories of farmers. Chapter five examines the franchise model of an agri startup (GAPL) which focuses on reaching small farmers and has been able to cover a large number of farmers across a number of districts in Bihar. Its operations are assessed based on interviews with franchises and a farmer (user and non-user) level survey to compare its services and their effectiveness with traditional channel user farmers. The final chapter summarises the major findings and insights from the four cases studies and tries to draw some inferences about improving the reach and effectiveness of such models so far as small farmer interface is concerned. It also provides some policy guidelines to leverage new institutional innovations for inclusive agricultural performance so far as farm input delivery for better quality supply and cost reduction are concerned.

Chapter 2
Sale, Purchase and Use of Agri Inputs and Services in India- A Review

This chapter reviews evidence on the existence and significance of various channels of farm input selling and service provision in order to identify gaps in understanding of the various aspects of the market and the marketing function in order to provide for inclusive and effective input supply models and systems. The section below reviews the major trends in custom hiring mainly in the case of PACS (Primary Agriculture Cooperative Society) and their performance in Punjab which is also one of our study service providing agencies, as Punjab has been a pioneer in this since the last decade. This is followed by a review of studies on major aspects of the traditional and modern farm input retailing channels especially rural supermarkets and farmer behaviour in purchase and use of farm inputs.

2.1 Custom rentals of farm machinery and equipment

Since this innovative and cost reducing service provision began in Punjab first of all as an institutional effort supported by the state, there have been some studies to assess its impact on farmers. A study of PACS run Agro Machinery Service Centres (AMSCs) in Punjab in 2012 found their operations economically viable and generating profits to the extent of 2% to 30% of their annual costs. Further, the services available to farmers were cheaper by 16% and 35% when compared with private sources and self-ownership respectively. These AMSCs initiated in the early 2000s owned machines like tractors and laser levelers with the help of bank loans, subsidy from the government and their own savings. The two AMSCs in Ludhiana district and their farmers, and farmers from two villages without AMSCs were studied based on a sample of 88 farmers belonging to three categories of AMSC farmers, private service provider farmers and self-owning farmers. It was found that AMSC services were being availed by all categories of farmers. The average size of operational holding across categories was 12.10 acres. The study focused mainly on the use of machines and equipment in wheat and paddy crops as they accounted for 80% of the gross cropped area of the State. Whereas most of the owners happened to be medium and large farmers, those hiring machines from private operators and AMSCs were largely marginal, small, and medium farmers. The average expenditure on use of farm machinery was the highest in the case of those hiring from private sources followed by those from AMSCs and those owning

the machines. The hiring cost was 16% higher in case of private sources compared with AMSCs. The fixed cost for self-owned machinery made the cost of use 35% higher than that incurred in case of hiring from AMSCs. The wheat crop costs were generally higher than those in paddy. Only 7% of the farmers using services of AMSCs owned a tractor or a disc which was even lower being only 3.4% each in the case of users of private services. On the other hand, those owning machines had tractor ownership of 90%, disc harrows 83%, trailer 54%, generator 23%, and rotavator 3%. The capital investment of the farmers using self-owned machines was 12 and 31 times higher than those hiring machinery services from private owners and AMSCs. The farmers perceived lack of timely availability of machines from the service centres as the only major problem with 46% reporting that. However, most of the farmers (89%) were satisfied with the functioning of the centres and almost all of them (96%) were happy with the hiring charges. Major suggestion for the improvement included increase in the number of machines in the centres (73%) and higher government support (8%) and training of manpower for handling machines more efficiently to some extent (19%). The number of machines and equipment owned by the two AMSCs numbered 40 and 27 each with one owning 4 tractors and 6 reapers and 2 laser levelers and the other owning 2 tractors and 4 discs, seed drills, and plankers each. These AMSCs had total investment of the order of Rs. 41 lakh and Rs. 16.61 lakh and total income of Rs. 26 and Rs. 9.5 lakh giving them net return of Rs. 6.3 lakh and Rs. 17000 being 31% and 2% of their annualised expenditure (Sidhu and Vatta, 2012).

Another study of AMSCs in Punjab based on a sample of 40 custom hiring and 80 tractor owning farmers across four districts found that most of the custom hiring farmers were marginal, small or semi-medium compared with tractor owning farmers who were mostly semi-medium, medium or large farmers in 2011-12 whereas none of the marginal farmers owned a tractor. The other categories of farmers had one or more tractors with an average of 1.23 tractors. A large majority of the tractors were of 35 HP with the others being 36 - 60 HP range. The average HP per farm was found to be 49 HP and 3.6 HP per acre. The number of non-farm earners was higher on custom hiring households (20%) compared with those owning a tractor (7%). There was very little presence of permanent labour on custom hiring farms (12 hours per annum per acre) compared with those owning a tractor (29 hours

per annum per acre). On both types of farms, family labour was of the order of 110 hours per annum per acre followed by 95 hours of casual labour. The custom-hiring farmers had a much smaller area operated and a much higher area under wheat compared with those owning tractors and had slightly lower yields of two crops. Though their annual per unit income from crops was similar, the custom hiring households had higher income from dairy and slightly lower gross farm expenditure and lower net farm income. However, marginal small and semi-medium farmers doing custom hiring earned net higher income than their tractor- owning counterparts. Major problems faced by custom hiring farmers included high cost of hiring, lack of timely availability and inadequate availability of services (Singh et al, 2013).

Another larger study covering 100 AMSCs across all the 20 districts of the State in 2011-12 based on population of 1045 such centres of which 208 were in the private sector and focused only on the operations of the AMSCs found that all the 100 centres which had come up from 2008 to 2012 had tractors with some owning more than one tractor each. The next major equipment was laser leveler owned by 96% followed by rotavator. The other equipment were owned by only a part of 100 centres ranging from above 50% in case of disc-harrows and ploughs to 35% in case of plankers and drills, 25% to 30% in case of disc harrows, bund maker and trailers. The specialised equipment like potato digger, paddy trans planter, sprayers and generators were owned by a few of the older ones. The proportion of own funds used in the purchase of the machinery was 100% in the case of sprayers and bund makers and even specialised equipment like happy seeders, potato diggers and seeder generators and paddy trans planters. Only in case of tractors and laser levelers, it was around 40%. Another major component of financing was 33% subsidy by the State Farmers Commission on the purchase of major machines which was availed by 89% of the Centres up to a maximum of Rs. 10 lakh investment. The Centres on an average served 114 farmers in 2011-12 which was 18% of the membership of PACS. The average area covered per Centre increased to 408 acres from less than 300 acres in 2009-10 to 400 acres in 2011-12. The Centres had an annual average income of Rs. 3.3 lakh in 2011-12 ranging from Rs. 3 lakh to Rs. 6.7 lakh within average expenditure of Rs. 1.9 lakh ranging from Rs. 15000 to

Rs. 4.2 lakh. This gave a net income of Rs. 1.37 lakh per centre ranging from Rs. 10,000 to Rs. 3.05 lakh (Chahal et al, 2014).

In Raichur district of Karnataka, a study of farm machinery custom hiring service centre revealed that a centre covered, on an average, 11 villages, 10386 ha of cultivable area and 2926 small and marginal farmers. Depending on the type, machine and equipment were used ranging from 0-100%. The services offered were at lower charge than those by private operators. The net return for a centre on an average was a low of Rs. 8822 per annum. Therefore, only 25% of the centres were high performing, another 25% medium performing and 50% were low performing. The centres had led to an improvement in the income of small farmers by 10-15% (Hiremath et al, 2014).

Another interesting case is that of agri mechanisation in China where average farm size is only 0.34 acres and lease of land to farmers by state is for 30 years. With only 5% farm power being animal based in China (as against 9% in India), the custom hiring farmer co-operative companies operate across provinces with one Combine Service Enterprise (CSE) harvesting 200 farms or 133 ha or two farms/day with 100 days of work. These co-operatives adopt a strategy to not compete with each other and access lower cost spare parts together for a group of 5-10 CSEs who are part of the co-operative. These are all private initiatives initially supported by the state with harvest calendars across regions which overtime has been managed by the CSEs themselves with own experience across provinces (Yang et al, 2013).

There is private paddy-wheat custom hiring service sector in India where owners are mostly graduates or diploma holders and are medium land owners and operators (about 15 acres) including some landless and marginal in Maharashtra; mostly with electrical tube well (multiple) irrigated lands and grew traditional crops. Mostly harvesting machines are tractor driven, except in Maharashtra, and were mostly Standard and John Deere brands due to brand reputation and other farmer experience. In Punjab, these were bought since 1990 and Gujarat and Maharashtra only since 2005. They were either bought from company, dealer or other farmer with 100% credit. Replacement sales were only in Punjab. The use varied from 90 days in Maharashtra to only 50 day each in Punjab and Gujarat and 600-800 hours

annually. They were mostly used in Rabi in Gujarat and Maharashtra and both seasons in Punjab. Custom hiring was across states like in China (Singh, 2009).

2.2 Profile and behaviour of customers of modern rural supermarkets

In Punjab, 65.83% of the customers who purchased their agri-inputs from organized rural retail outlets had more than 20 acres of land holdings. 97.49% of the customers had more than 5 acres of land holdings and only 2.50% of the farmers had less than 5 acres of land holding. 46.66% of the farm households surveyed had income between Rs 150,000-500,000 and 35% had income above Rs 500,000. Only 15.83% of farm households had income below Rs 150,000 and 1.66% below Rs 80,000. These figures clearly indicate that the majority of the customers of organized rural retail have more than 20 acres of land holdings and they belong to higher income group. More than 58% of farmers purchased implements and tools, seeds, fertilizers, pesticides and lubricants from the organized rural retail outlets. A smaller percentage 31% and 9% also utilized soil testing and water testing services respectively. Maximum expenditure was incurred on purchase of fertilizers and pesticides which on an average amounted to Rs 15,570 and Rs 14,150 respectively. Average expenditure on lubricants and diesel, seeds and implements and tools was Rs 13,691, Rs 7,575 and Rs 2,445 respectively. The findings indicate that fertilizers and pesticides consume a major share of the expenses incurred in purchasing agri-inputs (Dharni and Singh, 2011).

Reardon et al (2011) study in MP focused on farmer level purchase of farm inputs and also the exploration and examination of innovations in business models attempted by modern supermarket retailers to ensure competitiveness, inclusiveness, sustainability and scalability. Based on a sample of 810 farm households (both CS users and non-users) surveyed in 2009 in 30 villages around six out of the 11 ITC Choupal Sagar (CS) outlets located in the peri-urban areas in the Malwa Plateau region which had similar agro-climatic conditions and Soybean and wheat are dominant crops, with horticulture having a little more presence in east zone found that it comprised of 45% small/marginal farms (51% of the population weighted), 28% of semi-medium (27% for population weighted) and 27% medium/large farms (22% for population weighted).The average size of the farm for the

sample was 4 ha per farm. The average farm size for users of CS was 4.9 ha compared to the 3.2 ha of the control group who did not use CS, when the average size of holding in the state was 2 ha. In MP, 68% of the farmers are marginal or small but they cultivate only 29% of land. Further, 172 input retailers were surveyed which included 145 traditional (small private input shops), 6 CSs, and 21 PACSs who all reported the share of marginal and small in their clientele to be between 40-45%. The average size of CS was 10500 square feet, when compared to 1650 square feet of PACS store and 1500 square feet of traditional input shop.

Rao et al (2011) studied the pattern of sources from where the marginal, small and medium farmers purchased their agri-inputs from, and examined the inclusiveness of various types of channels so far as the small farmers are concerned. It also focused on new channels i.e. chain stores like Viswas or Mana Gromor of Nagarjuna group to explore the existence of any bias in terms of selling their products mostly to medium farmers when compared to traditional retailers and state/coop stores. Based on a study of 810 households including 420 supermarket chain outlet users and 390 non-users across 39 villages in the periphery of six Viswas (retail chain) outlets across AP, it was found that 65% sampled farmers were marginal or small and the rest medium farmers. More of the marginal and small farms were irrigated than medium farms. A higher proportion of Viswas users were in medium (includes semi-medium, medium and large) category (42%) compared with only 28% in case of non-users with average farm size being 2.61 ha in case of users and even as large as 3.08 ha in one region, and 2.05 ha in case of non-users compared with average size of landholding in the state being only 1.26 ha. The study also interviewed about 100 other types of retail outlets like traditional retail or government or cooperative outlets selling agri inputs. More of the marginal farmers were members of SC/ST (Scheduled Caste/Scheduled Tribe) category and most had BPL cards but 31% of marginal and 45% of small category had never visited the modern retail chain store which was same as for medium category. The number of footfalls was higher for traditional stores and modern stores had only as many footfalls as the state or co-operative stores. But, modern stores catered more to medium and large farmers compared with traditional and state co-operative stores.

Quality, freshness of the product, trustworthiness, variety under one roof and credit availability were reported to be the main reasons for choosing to buy from the organized rural retail outlets by 65%, 64%, 63%, 62% and 61% of the farmers respectively. The organised retail outlets fared well on proximity, suitable timing and price of products; with 44% farmers citing nearness/convenience, 41% citing suitable timing and 26% citing lower prices as reason for their choice to purchase from organized rural retail outlet (Dharni and Singh, 2011). In Lucknow and Ghazipur districts of Uttar Pradesh, significant differences between perceived attributes of organized retail outlets and unorganized retail outlets were observed. Quality was reported to be better at organized retail store when compared to unorganized store/local market whereas the price was found higher at organized store when compared to unorganized retail outlet. It was reported that needed products were readily available most of the times at organized retail stores whereas they were in shortage many times at the unorganized retail stores (Ali and Srivastava, 2013).

In Punjab, price, packaging and brand was given the highest score by the farmers for importance as a factor while purchasing from organized rural retail outlets i.e. 4.16, 4.10 and 4.05 respectively out of total of 5. Quality, fresh inventory, variety, credit facility, convenience/nearness and other factors were given lower score than price, packaging and brand (Dharni and Singh, 2011). But, it is surprising that when quality, fresh inventory, variety, credit availability were given as the main reason by more than 60% of the farmers for purchasing agri-inputs from organized rural retail outlets, why these factors scored low on importance. Further, farmers who purchased agri-inputs from top rural retail outlets gave the highest importance score to price, packaging and expert advice (4.08 each) followed by credit facility (4.00). While brand, quality, freshness of inventory, variety, company image were given lower scores. Farmers who purchased agri-inputs from bottom organized rural retail outlets gave highest importance score to price (4.23), brand (4.15) and packaging (4.12). Freshness, credit facility and home delivery were considered as least important. Rank correlation coefficient of 0.616 indicated that the farmers who purchased agri-inputs from top rural retail outlets and who purchased agri-inputs from bottom rural retail outlets given similar rankings to the factors considered important at the time of purchase (Dharni and Singh, 2011).

In Uttar Pradesh (UP)**, f**armers who purchased from Godrej Aadhar outlets gave price, brand, packaging, expert advice, freshness, credit facility, safety, quality and variety the highest importance scores in descending order 4.35, 4.22, 4.17, 4.17, 4.12, 4.07, 4.03, 4.02 and 4.02 respectively. Company image, home delivery, fair billing and convenience/nearness were considered relatively less important for Godrej Aadhar outlets. For HKB, highest importance score was given to packaging, price, brand, expert advice, quality, convenience/nearness, variety, safety and credit facility in descending order 4.03, 3.97, 3.88, 3.85, 3.83, 3.83, 3.83, 3.82 and 3.72 respectively. Company image, home delivery, freshness and fair billing were considered relatively less important. Price comes out to be a common important factor in both the outlets. Rank correlation coefficient of 0.626 indicated that the group of farmers purchasing from Godrej Aadhar and HKB have similar consideration regarding important factors for purchasing agri-inputs with regards to separate outlets. Convenience was considered less important in case of Godrej Aadhar while more important in HKB indicating that Godrej Aadhar stores would be located relatively near to the farmers when compared to HKB outlets (Dharni and Singh, 2011).

2.21 Seed purchase and use

In general, in Punjab, majority of the farmers (82%) were using home-retained wheat seed and only 18% purchased from other sources. Out of the total seed requirement of wheat seed, small, medium and large farmers purchased 20%, 22% and 14% respectively (Singh et al, 2011). Seed purchased from market, seed purchased/obtained from other farmers and self-retained seed were the three main sources of wheat seed in Punjab. As expected, 75.37% (by quantity) of the seed used was self-retained wheat seed. Higher price (almost double) for quality seed was the major discouraging factor in adoption of quality seed. 81%, 73% and 74% of the small, medium and large farmers used self-retained seed respectively. The other reason was that the retained seed and quality seed were virtually of similar quality as the stored wheat seed does not lose quality (Verma and Sidhu, 2011).

Out of the 8% wheat seed sold by commission agents, 5%, 8% and 10% was sold to small, medium and large farmers respectively. Small farmers purchased 5% of their wheat seed

from commission agents and 1% from PAU (Punjab Agricultural University). Medium farmers brought 8% and 4% of wheat seed from commission agents and PAU respectively. Large farmers brought 10% and 7% of wheat seed from commission agents and PAU respectively. Out of the total 4.13% seed supplied by authorized dealers; 6% was supplied to large farmers, 3% to medium farmers and 2% to small farmers. Out of the 1% wheat sold by cooperatives; small, medium and large farmers purchased 0.64%, 1.08% and 1.25% respectively. Seed Replacement Rate (SRR) of 7.80, 10.73 and 18.41 was observed for small, medium and large farmers respectively with an overall average 12.36%. It can be said that still three quarters of the farmers use self-retained wheat seed. From the above findings it is evident that small farmers have lower access to more public sources of seed like cooperatives and PAU (Verma and Sidhu, 2011).

Of the total 24.63% seed purchased by the farmers; commission agents, village shopkeepers, unauthorized private dealers, relatives and friends, fellow farmers, PAU, state department of agriculture, authorised seed dealers and cooperatives sold 8%, 2%, 1% 0.72%, 0.60% 4.31%, 4.13%, 3% and 1% of the wheat seed to farmers (Verma and Sidhu, 2011).

In Bathinda and Mansa districts of Punjab, the authorised seed dealers dominated the cotton (American) seed market by selling seed to 34% of the farmers followed by the village shopkeepers (24%), commission agents (14%) and unauthorised dealers (2%). Village shopkeepers, commission agents, Punjab Agricultural University (PAU), State Department of Agriculture, relative and friends, and private seed companies sold cotton (American) seed to 24%, 14%, 5.08%, 2.41%, 3.31% and 0.14% of the farmers respectively (Singh and Sidhu, 2006).

Small farmers purchased their 19% cotton (American) seed from authorized dealers, 45% from village shopkeepers, 21% from commission agents and 2% from relatives and farmers. It was surprising to note that none of the small farmers bought their seed from PAU or the state department of agriculture. Authorised seed dealers were major source of cotton (American) seed to medium farmers (41%), followed by village shopkeepers (26%),

commission agents (17%), relative and friends (3%). Large farmers purchased their 39% cotton (American) seed from authorised dealers, 10% from village shopkeepers, 8% from commission agents, 4% from relatives and friends, 8% from PAU and 4% from state department of agriculture. From the findings, it is evident that more medium and large farmers are buying seeds from authorised dealers (80%) when compared to 19% of small farmers. Village shopkeepers sold cotton (American) seed to 71% small and medium farmers. This indicates that medium and large farmers are more aware in terms of source of seeds (Singh and Sidhu, 2006).

Quality of seed, performance of variety, market acceptance of output and the image of the company were major factors influencing the farmers' decision to buy a particular vegetable seed variety or brand in Andhra Pradesh (AP). Price of seed had a least effect on farmers' decision. The word-of-mouth from fellow farmers followed by dealers recommendations were the other major influencing factors which shaped farmers decision to buy any particular seed (Murthy et al, 2003).

In Madhya Pradesh (MP), there were choices for farmers in terms of seed selling outlets of different type of agencies numbering 8. The seed replacement ratio (all seed –certified and otherwise) for soya and wheat was 53% and 50% respectively. Farm size did not alter the seed purchase. At least some kind of seed was purchased by 77% of the farm households. The participation rate differed for small farmers and larger farmer's viz. 79% and 70% respectively. Choice of the vendor was not affected by availability of credit. Among all the three type of sellers, 94% of the transactions were reported to be in cash only. Overall 93% of the farmers were satisfied with the transaction. Dissatisfaction was reported in the remaining 7% cases due to spurious or fake seeds. Satisfaction levels were highest for the transactions made with Choupal Sagar (CS) (98%), followed by state/coop retail (96%) and traditional retail (91%). Small farmers also reported high satisfaction levels of 90% (Reardon et al, 2011).

Traditional retail sold the highest quantity of wheat seed (54% by weight) and soy seed (54% by weight), followed by the state/coop retail (24% and 27% respectively) and ITC

CSs (13% and 14% of wheat and soy seed respectively). 34%, 14%, 12% and 36% of the soyseed was purchased by the small farmers from small shops, from other farmers, ITC and from state/coop retail. It was a surprising observation that about 33% large farmers relied on state/coop retail, 11% on ITC, 32% on small shops and 8% on other farmers.

It was observed that out of the total seed (by volume) sold by the state/coop retail only 19% of wheat seed and 26% of soy seed was sold to small/marginal farmers. On the other hand, the CSs sold about 25% of its wheat as well as soya seed to small/marginal farmers. Both the traditional retailers and other farmers sold about 20% of their wheat seed and 22% of their soya seed to small/marginal farmers which are quite comparable with the state/coop stores thus indicating that the traditional sector excludes small farmers when compared to state and CSs.

The price of wheat seed was found to be the highest at the CSs (19 Rs/kg), followed by state/coop stores (16.2 Rs/kg) and traditional retail (15.3 Rs/kg). Consistent with the price, the quality of the wheat seed was reported to be higher with state/coop and CSs when compared to traditional stores. However it was observed that the soya seed was 10% more expensive at CSs and traditional retail outlets compared with state/coop stores.

Timely availability and proximity were found to affect the choice of outlets to a great extent. For soya, 60% of small farmers and 44% of large farmers reported the timely availability to be the strongest factor affecting choice of outlets. For soya, 23% of large farmers and 7% of small farmers reported quality to be the factor determining the choice of the outlet. Availability of credit did not have any significant impact on the choice of the outlet.

Wheat and soyseed sales of traditional shops comprised of 30% loose, 22% local brands and 9% of unbranded seeds. Amongst the three formats, local brands sale was reported to be the highest in the traditional stores (17% of transactions), followed by 11% and 4% at the state/coop and CSs respectively. Strikingly, the 32% of the soya seed sold by traditional retail was sold loose when compared to negligible 6% and 3% for state/coop and CSs. It

was observed that the widest range of stock keeping units (SKUs) was available at traditional retail followed state/coop stores which stock medium and large SKUs and the least variety of SKUs was observed at CSs which stocks mostly large units (Reardon et al, 2011).

In Uttar Pradesh, Reardon et al (2011) also found that farm size did not affect purchase of seed which was purchased by 85% of the farm households. Seed was purchased by 82% of marginal farmers and 93% of the small and medium farmers. Rice and wheat dominated in seed purchase with 76% of transactions relating to them, 36% and 40% for rice and wheat respectively. 75% of the farmers had purchased wheat seed in the past year. 56%, 24% and 21% of wheat seed (by volume) was sold by traditional retail, modern supermarket retail, and state/coop retail, respectively, thus indicating the dominance of the private sector in wheat seed market. It was reported that medium farmers paid more for wheat seed when compared to poor farmers. Wheat seed prices at the modern retail outlets were found to be 10% higher than other outlets. However the quality of the seed at RBH was reported by the farmers to be higher.

Only 12% of the marginal farmers, 16% of the small farmers and 22% of the medium farmers purchased it from state/coop stores where 62% of the wheat seed was sold to medium farmers. This contradicts the fact that the state/coop stores are an importance source of seed, especially for the poor. 21% and 27% and 20% of the marginal, small and medium farmers respectively purchased wheat seed from the HKB. It can thus be said that the marginal and small farmers relied more on HKB than on state/coop stores for their wheat seed purchase. Infact, HKB was selling more if its seed to marginal and small farmers than that sold by state/coop stores. Traditional retailers who have majority share of 55% dominated wheat seed market.

Credit did not play any major role as 93% of the transactions were “spot” transactions on cash. This looks very surprising but it was possible that though seed was bought on cash mostly, it was made up of no option of credit at modern stores and cash sales back by credit from other sources like commission agents for seed purchase. Quality of seed followed by

proximity and timely availability were the major factors influencing the choice of the retailer type. HKB was ranked highest for quality (75%) followed by state/coop retail (42%) and traditional shops and other farmers stood last at 21%. However, for timeliness and proximity, first two positions were occupied by traditional shops followed by state/coop retail respectively and HKB stood last (Reardon et al, 2011).

A majority (64%) of the farmers reported having purchased paddy seed last year. Moderate farm size bias was seen in paddy seed purchase as 59%, 71% and 80% for marginal, small and medium farmers bought paddy seed respectively. Traditional dominated the paddy seed market with share of 57% (by volume) followed by HKB (27%) and state/coop retail (14%). State/coop stores were the cheapest source of paddy seed with price of 21 Rs/kg followed by traditional retail at 43 Rs/kg and seed was most expensive at HKB at 47 Rs/kg. It was reported HKB catered more to small and medium farmers, state/coop catered more to medium farmers and marginal farmers were catered mostly by the traditional retail. Only 16% of the marginal farmers purchased paddy seed from HKB. State/coop retail sold only 31% of the rice seed to small and marginal farmers, which is contrary to the fact that state/coop stores are meant to serve poor farmers. However it was interesting to find that HKB sells about 38% of its paddy seed to small/marginal farmers indicating that the products at HKB are not costly as it is generally perceived. Small shops sell 53% of their paddy seed to small/marginal farmers. Quality of seed (38%) followed by proximity (32%) were the major factors influencing the choice of retailer type. Price and credit played a negligible role in choice of vendor. Highest quality seed was provided by HKB followed by state/coop retail and traditional retail ranked further third for quality (Reardon et al, 2011).

In AP, paddy **s**eed was available at Maximum Retail Price (MRP) as reported by 75% of the farmers. Only 5% of the farmers bought seed at a price higher than MRP or they could not find seed at MRP or even at a price higher than MRP. Seed was purchased by 92% of the farm households. Farm size did not have any effect on seed purchase. Rice, chillies, and cottonseed occupied major share of the total seed purchased with figures of 48%, 13% and 13% respectively. Peanuts, maize, sunflowers, gram, *arhar/tur*, vegetables, pulses and spices comprised the remaining 25% share of the seed purchased. Timely availability of

seed was considered as a constraint in the availability of seed by only 1% of the farmers and pricing as a constraint only 1.7% of the farmers. Seed quality was reported to be not a constraint by 95% of the farmers. 93% of the transactions were spot cash transactions. Even the small shops provided credit in only 18% of the transactions. Paddy seed was purchased by 57% of the farmers. 138 kg seed was purchased by an average AP farmer. There was no much variation in the price of paddy seed paid by different farm strata. This was similar to the trend found in MP. Traditional shops dominated the paddy seed market by selling paddy seed to 87.5% of the farmers, followed by state/coop stores with 3.3% and modern retail stores 0.4% respectively. Price of paddy seed was same at state/coop and traditional stores (17.9 Rs/kg). Viswas sold paddy seed at a 16% higher price than the price at traditional and state/coop stores. The high price of the seed at Viswas may be attributed to the higher quality seed supplied (Rao et al, 2011).

In AP, only 6.7% of marginal farmers and 6.5% of small farmers purchased their paddy seed from state/coop stores. This is in contrast with results observed in MP where a higher percentage of farmers brought their seed from state/coop stores. State/coop retail had a minor overall share of 6% in paddy seed. Modern retail was more or less absent from paddy seed sale in AP unlike in UP. Very small numbers (0.6% and 0.3%) of the small and medium farmers purchased paddy seed from Viswas whereas none of the marginal brought seed from there. Whatever a little quantity of paddy seed was sold by modern retail was sold at Mana Gromor outlets, and not Viswas. Traditional retail dominated the paddy seed market in AP by selling 94% of the seed and 97%, 93% and 93% of paddy seed sold to marginal, small and medium farmers respectively. This is similar to the trends observed in MP. Out of the total paddy seed purchased 50% was purchased by medium farmers. Out of the total 3.3% paddy seed sold by state/coop stores, only 9% was sold to marginal farmers, 35% to small farmers and 57% to medium farmers. This is in line with the results reported in MP showing that state/coop stores cater very little to marginal farmers. When compared to state/coop stores, PACS sold about 19% of their seed to marginal farmers and 50% seed to marginal and small farmers combined (Rao et al, 2011).

Viswas supermarket stores sold mainly to medium farmers whereas Mana Gromor sold to small farmers. Majority of the small farmers (52%) were mainly catered to by traditional stores. Timely availability was the main reason cited by 49% of the farmers which influenced their choice of vendor followed by quality assurance (43%). Credit influenced choice of vendor in only 1% of the cases. The results are similar to those reported in MP. Best quality seed was reported at modern retail by 67% of the farmers, followed by state/coop (55%) and traditional retailers (43%). However, traditional stores were ranked highest with regard to timely availability of seeds. Branded seed occupied 66% of the share of the seed sold when compared to 25% of the seed sold loose. Almost all the farmers were satisfied with seed that they had purchased (Rao et al, 2011).

Only 19% of the farmers purchased chilli seed as only that many farmers grew chilli crop. Chilli seed was priced high at 28,000 Rs/kg. Traditional retailers dominated the market by selling to 87% to the farmers which accounted for 87% of chilli seed market, while only 2.6% bought from modern stores which had only 5.4% of chilli seed market. State/coop stores share was less than 1%. Rs. 8144 was the average expenditure of farmer on 330 gm of chilli seed. None of the marginal farmers purchased the chilli seed from modern stores, while 2.1% and 10.7 of small and marginal farmers brought their chilli seed from these outlets respectively. Small farmers purchased the entire seed from Viswas while medium farmers purchased 3/4th quantity from Viswas and rest from Mana Gromor respectively. 95% of the marginal farmers purchased their seed from traditional retailers and 4% of them depended on mandis for the seed whereas small farmers purchased 91% of their chilli seed from traditional retailers. Out of the total chilli seed purchased; 61% was brought by the medium farmers. 81% of chilli seed as bought on cash transaction. Quality assurance (for 44% of the transactions) was a major factor influencing the choice of the outlet, followed by timely availability (30%). 81% of the transactions for chilli seed were spot cash transactions. 88% of the transactions made by small farmers were paid by cash on the spot when compared to 72% by the medium farmers. Around 28% of the transactions were credit for medium farmers. 92% of the chilli seed is sold branded, 7.5% is unknown and 0.5% is unbranded. Almost all the seed sold from state/coop retail was branded when compared to 92% of the seed sold by traditional retailers was branded (Rao et al, 2011).

2.22 Pesticides

In Khargone, Dewas, Ujjain and Sagar districts of Madhya Pradesh, only 1% of the farmers purchased agrochemicals from ITC e-choupal. Marginal farmers depended more on ITC for purchase of their agrochemicals (George and Lahiri, 2009). Another study (Reardon et al, 2011) observed that pesticides were sold at all the Choupal Sagars (CSs), 29% coop/state stores and 66% of the traditional stores. Pesticides accounted for noticeable share of the total agri-inputs sold by all kinds of retailers in study; with 42%, 33%, and 28% for traditional retail, CSs and state/coop stores respectively.

A pesticide or a herbicide was purchased by 88% of the households during the previous year. Farm size did not have any effect on the purchase of pesticide/herbicide. Pesticides dominated the farmers purchase amongst chemicals with 51%, followed by herbicides, fungicides and plant growth regulators at 41%, 6% and 1% respectively. Chemicals were most of the time available at MRP as reported by 93% of the farmers whereas only 4% of the farmers reporting the contrary. The pesticide purchase was approximately in correlation with the farm size in case of 77% of the households. It was observed that the smaller farmers paid 18% higher average price for pesticides (Rs 716 per litre) when compared to medium/large farmers (Rs 607 per litre). Traditional shops dominated the pesticide sales market by selling 80% of the total pesticide sold in market followed by CSs and state/coop stores with 13% and 4% respectively. It was surprising to notice that most of the pesticide from the state/coop stores was brought by medium/large farmers (Reardon et al, 2011).

The pesticides sold at CSs were 18% costlier when compared to the traditional retailers and state/coop shops. It can be due to the fact that either the farmers purchased niche products from CSs which are generally priced higher or they purchased commodity pesticides at higher prices. Special products were purchased from CSs by large farmers and commodity products from traditional shops. Whereas large famers went to CSs to get niche or quality products, small farmers did so to get cheaper products. Small farmers applied 50% more input to their land. This can be attributed to the fact that they small farmers get less access to proper extension service, or they rely on advice of traditional retailers or they might want to reduce the risk of unexpected crop failure by spraying more on the crop.

Among the different retailers, ITS CS was the most pro-small farmer by selling 26% of its pesticides to small farmers while the state/coop stores sold 87% of their pesticides to the large or medium farmers. Only 18% of the pesticide sales from traditional shops go to the small farmers. Small farmers bought 17% of the herbicide sold by ITC and 20% of the herbicide sold by traditional stores. Timely availability, proximity and quality were the three factors which influenced the choice of the retailer by the farmer. Credit played a negligible role. It was surprising to note that price was reported as a factor by middle and large farmers.

Traditional retailers provided the pesticides on time (74%) followed by ITC (50%) and state/coop stores fared last (30%). Best quality pesticide was supplied by ITC whereas the state/coop stores were found to be the most closely situated. Small retailers stocked the most diverse stock in terms of smaller units whereas ITC stocked larger units. Herbicides were purchased by 56%, 64% and 80% of the small, medium and large farmers respectively. Out of the total amount spent on purchasing herbicide about 73% were spent at traditional retail outlets, 18% at CSs and 5% at state/coop stores (Reardon et al, 2011).

In U.P., Reardon et al (2011) reported that 86%, 74% and 53% of the medium, small and marginal farmers respectively purchased chemical pesticides with average being 66% of all farmers buying chemical pesticides. Pesticides and herbicides occupied 91% of the total chemical market share (pesticides 53% and herbicides 38%), fungicides 7% and plant growth promoters occupying 2% market share. It was generally observed that larger farmers were more aware of branded pesticides, HKB was perceived to supply better quality pesticides. Farmers reported Price variation for same product at different stores.

State/coop stores sold pesticides to only 3% of the farmers when compared to 30% and 64% by HKB and traditional shops. 1% of the pesticides were sold by sugar mills who supply inputs and buy back sugarcane. 27% by volume (25% in rupees) of pesticide was purchased from HKB by the marginal farmers, the same figures for small and medium farmers were 34% by volume (16% in rupees) and 26% by volume (28% in rupees) respectively. This indicates that specialty products were purchased by medium farmers

from HKBs and commodity pesticides were purchased by small/marginal farmers. State/coop stores sold majority of their pesticides to medium farmers (83%) and only 17% to small and marginal farmers. Traditional shops sold 35% of their pesticides to small and marginal farmers while the same figure for the HKB was 40%. Small and marginal farmers selected the outlet based on proximity.

Herbicide was purchased by 39% of the sample and its use varied with farm size. Traditional stores dominated in the sales of herbicide with 60% herbicide market share, followed by HKB which held market share of 29% for herbicides and the last were state/coop stores with share of 1%. Herbicides were 10% more expensive at HKBs, this could be due to better quality being offered there or because of brands of chemicals sold. Marginal farmers spend 36% of their rupees spent on herbicides at HKB when compared to small and medium farmers who spend only 18-25% of the rupees on herbicides at HKB (Reardon et al, 2011).

In AP**,** 99% farmers used various types of crop protection products. Out of the total transactions 56% of the transactions were for pesticides, 31% for fungicides, 9% for herbicides and 3% for plant growth promoters. 90% of the farmers were usually able to find the chemicals at MRP. Farm size did not have any effect on pesticide purchase and 95% of the farmers purchased pesticides. This concurs with the fact that AP is the highest pesticide consuming state in India. Marginal and small farmers played slightly lower price for the pesticides when compared to medium farmers. State/coop stores sold pesticides to only 0.4% of the farmers, and just 1% market share (by volume sold) of which 2/3rd of the volume was sold by PACSs; Modern outlets (Viswas and Mana Gromor) sold to 17% of the farmers and traditional shops sold pesticides to 45% of the farmers. Further, 37% of the farmers purchased the pesticides from mixed sources which was higher than that in UP and MP (Rao et al, 2011).

Modern stores sold 34% of the volume share; however the traditional retail was still the dominant player with 60% share. Out of the total pesticides sold by the modern stores, 39% was sold to marginal farmers, 33% was sold to small farmers and 32% was sold to medium

farmers respectively. Most of the pesticides sold from modern stores were sold from Viswas outlets. Marginal and small farmers had higher usage rate of pesticides at 7.6 lt/ha and 6.8 lt/ha respectively when compared to usage rate of medium farmers at 3.4 lt/ha. Marginal/small farmers were sold the highest share by modern stores (61%), followed by state/coop stores (43%) and traditional retail (50%). Timely availability, quality assurance, lower price, credit and proximity were reported as main factors influencing the choice of the outlet type in 42%, 35%, 11%, 10% and 2% respectively.

Herbicides were purchased by only 31% of the farmers. This is very low when compared to the figures in MP. 41% of the farmers purchased herbicide from traditional shops, 16% from modern stores and the state/coop stores did not sell herbicide. Further, 44% of the farmers bought herbicides from several sources. This figure is higher when compared to the ones in MP. In terms of volume by liters, 27% of the herbicide was sold by modern stores; and they sold more to marginal and small farmers. Out of the modern store sales, 74% of the herbicide market share was with Viswas. Traditional retail still dominated the market with 73% share. Reasons for choice of outlets included timely availability, quality assurance, lower price and credit in that order.

A vast majority (74%) of farmers bought fungicides and the expenditure on fungicides was higher than that on herbicides but lower than that on pesticides. A slightly lower price was paid for fungicides by the medium farmers when compared to marginal/small farmers. This is in contrast to the situation in pesticides. 45% of the farmers purchased fungicides from traditional retail followed by 16% from modern stores (Viswas and Mana Gromor) and 0.5% from state/coop stores respectively. 39% purchased from mix of sources. But, modern stores account for 40% of fungicides sold. This is in contrast to MP where much lower percentage of farmers purchased from mix sources. Traditional retail dominated the fungicide market with a share of 59%. The modern retail sold only 36% (by volume) to the small/marginal farmers when compared to traditional retail which sold 43% to marginal/small farmers.

Higher number of smaller SKUs was found at traditional shops when compared to the large number of large SKUs at modern stores. Out of the total pesticides sold about 75 to 90 % belonged to the top three companies. Products of similar brands were found across different retailers. Farmers had to spend some time in order to find the chemical of their choice. It was observed that 7/9 of the chemicals were missing at the state/coop stores, 3/9 at modern stores and 0/9 at traditional retail. Thus, traditional retail offered the widest variety of chemicals. Reasons for choice of outlets included timely availability, quality assurance, lower price and credit in that order (Rao et al, 2011).

2.221 Selection of brand

In Tuticorin district in Tamil Nadu 48.33% of the farmers' sought information from private dealers, 45.83% from extension workers and 38.33% from advertisements (Padmanaban, 2002). With an increase in farm size, the decision to purchase particular agrochemical was more influenced by the results obtained by application to crops than on the advice of retailers (George and Lahiri, 2009). In Coimbatore district in Tamil Nadu, private dealers and extension workers were the main source of information and played an influential role on the farmers' choice in selection of brand. Farmers were more loyal towards those dealers who supplied quality products and offered credit than those who only offered credit. By the use of multiple regression models it was revealed that the price of brand and efficiency of brand play a significant role in the shaping up of brand loyalty of farmers (Padmanaban, 1999).

Farmers' decision regarding the choice of pesticide and vendor was strongly influenced by the price of pesticide and credit availability Farmers were able to recognize the pesticides from its brand name, colour of packing and symbol in South Tamil Nadu (Padmanaban and Sankaranarayanan, 1999).

2.222 Problems in pesticide market

In Haryana, the major problems reported by the farmers with the purchase of pesticides included poor quality of pesticides (63.75%), higher price (57.50%) and adulteration (46.25%). The other problems reported were size of packing (27.50), non-availability of

particular pesticide which farmer wanted to purchase (26.25%), distance to market (8.75%) and leakage of packing (5%). Farmers were more satisfied by purchasing pesticides from cooperatives as they reported very low percentage of the above problems with the pesticides purchased from the cooperatives; 7.50, 5.00, 2.50, 10.00, 4.11, 12.50 and 4.11 for poor quality of pesticide, higher price, adulteration, size of packing, non-availability of pesticide wanted, distance to market and leakage of package respectively (Grover and Luhach, 2006). Private traders dominated in the sale of pesticide to farmers in Haryana. Small (83.34%), medium (97.22%) and large (85%) farmers purchased pesticides from private dealers. The major reasons cited for high purchase from private dealers were easy availability and payment at the time of harvest. In certain cases, it was observed that commission agents issued slips to farmers for lifting of pesticides from the retailer from whom farmer wanted to buy pesticides from (Grover and Luhach, 2006).

2.23 Fertilizer

Fifty per cent of the traders each in West Godavari and Adilabad and 33.34% in Chitoor (Andhra Pradesh) reported that the main problem was the non-availability of fertilizer. The problem in the cooperatives outlets was much more critical as the fertilizer companies hesitated to supply fertilizer to cooperatives because of the financial crunch the cooperatives were facing. There was no problem reported with the price as the fertilizer was supplied at government-controlled price in all the three districts. Cooperatives sold fertilizer only on cash while the private traders sold both on cash and also offered credit (Raghuram and Chawdry, 1999).

A more recent study (Rao et al, 2011) showed that **f**ertilizer is supplied by Indian Farmers' Fertiliser Co-operative (IFFCO) and Krishak Bharati Co-operative (KRIBHCO) to the AP cooperative marketing federation (AP MARKFED) which in turn supplied to the PACS. All the farmers purchased fertilizer and irrespective of the farm size, the fertilizer usage rate was high. 56% of the fertilizer transactions were for Urea and DAP. This is in contrast with the findings of MP where 75% of the transactions involved Urea and DAP. Greater variety was found in fertilizer usage in AP when compared to MP and the NPK balance was maintained unlike that in MP. In AP, farmers were reported using MOP-MAP (14%), NPK

(12%) and other nutrients such as gypsum, zinc and iron (5%) and others (13%). Medium farmers used micronutrients the most followed by small and marginal farmers.

Timely access was reported as a bottleneck to the availability of the fertilizer by 11% of the farmers, price by 7% and quality and variety by only 1% each. Fertilizer was not available at MRP or below in case of 22% of the farmers. The respective figures for MP were 5% and 20% respectively). Overall, high brand consciousness was there and only 1% was sold without brand though brand awareness among farmers was low. The farmers reported high satisfaction from purchase. This is similar to the situation in MP.

Only 10% of the transactions at state/coop stores were done at above MRP, compared with 27% and 44% for modern retail and traditional retail respectively. Timely availability was the major reason for selection of vendor by 53% of the farmers, followed by quality assurance (29%), credit (8%) and price (7%). State/coop stores were ranked the highest for quality followed by modern stores and the last was traditional shops. Traditional retailers were ranked best for timeliness. 15% transactions from traditional shops were on credit, followed by 1% from modern stores and none in case of state/coop stores.

Urea was purchased by 93% of the farm households. The high usage rate of Urea was similar to that in MP. Fertilizer cost 2% higher for marginal farmers when compared to small and medium farmers. AP farmers bought fertilizer from multiple sources when compared to the farmers in MP. Fertilizer was purchased from several sources by 44% of the farmers while 45% purchased only from traditional retail, 11% only from state/coop stores and 3.6% only from modern stores. Urea was found to be relatively cheaper (3%) at state/coop stores (5.11 Rs/kg) when compared to traditional retail (5.25 Rs/kg).

State/coop stores sold urea only to 20% of the marginal farmers when compared to 31% and 32% to the small and medium farmers respectively. This was also the case in MP where the state/coop stores mainly catered to the small and medium farmers. Share of modern retail in Urea market in AP was only 10%. From this, sales to marginal farmers comprised 11% (by weight), small farmers 10% and medium farmers 11%. Mana Gromor

sold the remaining more than 80% of Urea to other categories of farmers. Traditional retail dominated the Urea sale with 60% of market share; Out of the total Urea sold by state/coop stores, only 11% was sold to marginal farmers, 38% to small farmers and 52% to medium farmers. PACS sold nearly all the Urea sold through the state/coop stores. The results are in line with the findings in MP and UP that the state/coop stores mainly serve to the medium farmers. 49% of the medium and 51% of the small/marginal farmers formed the clientele of modern stores which was like the clientele of the state/coop stores. Viswas chain which had a share of $1/4^{th}$ catered mainly to marginal/small farmers when compared to Mana Gromor which has $3/4^{th}$ share. Traditional retailers sell 54% of their Urea to small/marginal farmers. In AP it was found that traditional stores have more variety of fertilizers when compared to modern retail and this was in contrast with MP and UP where more variety for fertilizer was found with the modern stores. Further, main fertilizers were sold in branded forms and in various stock-keeping units (Rao et al, 2011).

In MP, fertilizer was sold by all the Choupal Sagars (CSs), 62% of traditional shops and 86% of the state/coop stores. Fertilizer comprised about 50% of the total sale of agri-inputs made by CSs, 70% by state/coop stores and 57% by traditional stores. The widest variety of fertilizer was available at the CSs, followed by traditional retailers with the state/coop stores having the least variety. IFFCO and KRIBHCO brands were found to be sold most (90%) in state/coop retail, 73% in CSs and 70% in traditional retail. The remaining percentage comprised of the private brands. Fertilizer was purchased by 98% of the sample farmers. Bottlenecks reported by farmers in getting the fertilizer included timely access (15%), price (10%) and fertilizer quality (6%). Farm size did not affect farmers' responses with respect to bottlenecks in availability of fertilizers. A high rate of satisfaction of 98%, 98% and 97% was reported for state/coop, CS and traditional sector transactions respectively. More than 93% of the farmers across all the three strata reported that they can always find fertilizer at MRP. It was reported that a small fraction on 0.5% of the farmers did not get fertilizer because of non-availability and 5% reported it not being available at MRP (Reardon et al, 2011).

There was no much variation observed between the units in which fertilizer was purchased. Large sack comprised the main selling unit with 88%, 81% and 87% of the sales taking place in large sacks for state/coop, CSs and traditional retail respectively. Average fertilizer transaction of 2 tons was reported across all the three retail formats. Timely availability in 44% of the transactions and proximity in 32% of the transactions were found to be two major factors influencing the choice of the vendor. Traditional retail performed the best on timely availability while state/coop stores outperformed the others on proximity. Quality was considered to be influencing factor in only 10% of the transactions. CS was ranked the best for quality. Price played a role as a factor in only 1% of the transactions.

Availability of credit was reported as a factor influencing the choice of outlet in 5% of the transactions. Only 14% of the transactions were credit transactions. Credit was only part of the transactions made at the state/coop stores. However, still 78% of the transactions at state/coop stores were on the spot cash transactions, rest of the credit payments were made at harvest time. 78% of the fertilizer purchase comprised of Urea and Di-Amonia Phospohate (DAP) followed by Single Super Phosphate (13%). Urea was purchased by 89% of the households. At an average 210 kg per ha of Urea was purchased by sampled households which is much higher than the usage rate recommended. It was reported that small farmers used twice the amount of Urea than that by the large farmers (Reardon et al, 2011).

State/coop stores were found to sell major amount of Urea (52% by weight) across all the strata of farms, followed by traditional retail (31%) and ITC (10%). Urea was found to be the cheapest at ITC (4.6 Rs/kg) followed by state/coop stores and traditional retail at 4.9 Rs/kg and 5 Rs/kg respectively. It was seen that the wholesalers also sold directly to medium/large farmers thus generating price advantage in order to compete in large market of medium/large farms. Large and medium farmer paid 4% less than small farmers as they bought it from CSs or wholesalers. Large farmers had preferential access to PACS whenever there was shortage of fertilizer. The state/coop stores which were meant to cater to the inputs needs of the poor farmers sold only 28% of Urea to small/marginal farmers and remaining 72% to semi-medium, medium and large farms. This is in contrast with what

the state/coop stores were meant for i.e. to cater to the needs of the poor farmers at subsidized rates. Only 18% of the Urea sale of ITC was made to small/marginal farmers (Reardon et al, 2011). But, given the land share of small and marginal farmers, state and co-op stores are doing well.

In case of U.P., Reardon et al (2011) also found that farm size did not influence the purchase of fertilizer. About 91% of the farmers reported having purchased fertilizer in previous year. Urea and DAP occupied first place with 79% of the transactions, third was NPK (7%) followed by SSP (4%), MOP (3%) and others (8%). Timely access to fertilizer was reported as a bottleneck by 47% of the farmers and price by 26% of the farmers. 20% of the farmers reported that it was very difficult to get fertilizer at MRP or below. IFFCO/KRIBHCO brand had a share of 86% in state/coop stores, 53% in HKBs and 52% in traditional retail. Fertilizer was purchased in large sacks at all the three kinds of retailers in at least 81% of the transactions. It was reported that traditional retail shops sold the fertilizer above MRP 58% of the times, while the same figure for HKB and state/coop stores was 18% and 16% respectively. Traditional shops dominated in the sale with 33% share, followed by state/coop retail (28%) and HKB (11%).

This contradicts the long held belief that the urea market is dominated by the state. Cheapest Urea is available at state/coop stores (4.6 Rs/kg), followed by HKB (5 Rs/kg) and traditional stores (5.2 Rs/kg). 21% of the marginal farmers buy Urea from HKB, the same figure for medium farmers is 6%. Mostly the medium farmers buy Urea from state/coop stores where it is relatively cheap.

State/coop stores sold only 27% of their fertilizer to small/marginal farmers and the same figure for medium farmers was 73%. It was interesting to note that 67% of the HKB sales of Urea were made to small/marginal farmers. It was reported that larger farmers get preference at PACS due to various reasons whenever there is shortage of Urea. The choices of small farmers are further limited by the fact that traditional retailers refuse to give credit during the periods of shortage. Traditional stores were ranked the highest for timeliness and proximity whereas HKB was ranked the best for quality. Fertilizer sales comprised 66-75%

of the total sales of the traditional stores, for HKB 30-40% and 90-98% of the total input sales of the state stores. Most diverse range of fertilizers was stocked by HKB followed by the traditional retail (small shops) and the least by the state/coop stores (Reardon et al, 2011).

2.24 Agri equipment sales

In AP, farm equipment accounted for only 10% of the traditional shop sales and 26% of that of modern stores (Viswas), and negligible in case of state/coop stores. At modern stores, most of the equipment sold was small farm equipment. This is in contrast with the findings in MP where the large equipment is also sold at modern stores (Rao et al, 2011).

2.25 Extension

So far as role of extension in purchase and use of farm inputs is concerned, in MP, 80% of the households had availed extension service in the previous year. Of those who did not avail extension service, 62% cited no need for extension as a reason for not availing extension service while in case of another 29% farmers, extension was not available at right time. Small farmers availed extension service in larger numbers (83%) when compared to large farmers (75%). From the farmers who were not using extension, it was observed that it was the small farmers which stood higher chances of not using extension service (39%) when compared to large farmers (18%). Lack of timeliness and the lack of quality were main reasons for not availing extension service. Extension was availed to the same extent by CS and non-CS users. Extension service was found available most of the time by 88% of the farmers. About 10% of the farmers felt they did not get proper extension service. "General advice" was the most sought after in extension service (55%), followed by the extension service for need of new varieties (12%) and advise on fertilizer (10%). Very high satisfaction from extension service was observed among the farmers. 37% of the farmers availed extension from state extension officers, 35% from other public sector extension sources, 25% from private sector sources and the remaining share of the extension service was held by NGOs. From the 25% of extension service provided by private sector, the private companies provided about 13% and the ITC CSs provide 10% of the extension service (Reardon et al, 2011).

It was revealed out that farmers take advice of government extension agents, and farmers trusted the advice of KVKs and universities. Extension service of ITC CSs is available throughout the season when compared to private companies but with a limited outreach. The farmers argued that there was paucity of information with respect to new and improved practices for crop production techniques and yield enhancement. CS was seen as quality seed provider and there existed unmet demand for quality seed. With regards to fertilizer, ITC was perceived to be quality supplier at lower prices, but its model was not good enough to come close to farmers in terms of distance thus providing timely fertilizers to farmers (Reardon et al, 2011).

On the other hand, in AP, extension was used by 95% of the farm households from any source. The rate of extension usage is higher when compared to that in MP (18%). Among those who did not use extensions 53% did not need any extension. While marginal and small farmers did not use extension because they did not need it the medium farmers did not use extension because they did not find extension at right time. Modern store users and non-users equally accessed extension. Extension was said to be timely available by 85% of the farmers. Quality of extension was found high by 89% of the farmers. 96% of the farmers had satisfaction for extension service accessed. Extension was sought for advice on disease, use of fertilizer, new seed varieties, irrigation, and weather by 41%, 16%, 10% and 7-8% respectively of the farmers. Extension was provided by private sources in 68% of the events of extension. This is in line with the results reported in MP. From amongst the public sources of extension, state extension officers gave extension in 47% of cases, followed by KVKs in 21% cases, NGOs 18%, plant protection unit provided extension in 9% of the cases. Private companies provided extension in 45% of events. Private companies were also promoting their own products during extension. Modern stores provided extension in 17% of the events. Minor role is played by extensions officers belonging to fertilizer companies like IFFCO as they provide extension in only 7% of the events. Timely availability and quality topped the list of factors influencing the choice of extension source. Relevance and proximity were other important factors. Public sector provided extension to 33%, 28% and 36% of the marginal, small and medium farmers

respectively while the private sector to 67%, 72% and 64% for the marginal, small and medium farmers respectively. The modern stores provided extension to 13%, 14% and 21% of the marginal, small and medium farmers respectively. All the modern stores got extension from input manufacturers when compared to 80% of the state and traditional retailers (Rao et al, 2011).

2.3 Summary

The above review of various studies on various inputs across state and years shows that there are alternatives available to farmers in terms of various channels for input purchase and use of custom rental services, though the traditional channel still holds the sway in farm input selling and the co-operative channel is declining. The modern retail has made an entry but by and large is a minor player despite many edges like better quality products and more choice. Also, there are issues like adequate access to small farmers and viable operations at the store or chain level. This has meant that the initial enthusiasm has waned away and only a few innovative players remain but there are not many studies of such players. Further, most of the previous players in modern agri input retail have relied on COCO model which has not worked, by and large. Therefore, there is a need to examine more innovative initiatives which may be small scale but hold promise for scale up and more inclusive and effective reach to small farmers. The following chapters examine those models and their effectiveness with primary evidence.

Chapter 3
Agri-input markets in Punjab: A case of agri machinery rentals

3.1 Introduction

Increasing cost of cultivation in most parts of India has led to the realisation that mechanisation of farm operations is one of the ways to tackle it as mechanical soultions are more efficient as well as cost effective compared with human labour based activities in most situaitons. However, given small famr dominace of Indian agriculture, it is not possible and vialbe for small farmers to own farm machinery for its use. Therefore, what they need is access to it and not ownership. This was highlighted in many studies during the last decade (Singh, 2001; Singh 2009). In this context, custom rentals as an institutional innovation has come up in some parts of India starting with custom renting of combine harvesters which move across state and between states for harversting of wheat and paddy (Singh, 2009). Punjab has been a pioneer in this innovation in the form of PACS being facilitated by the state through its farmer commission to buy and rent out tractors and farm equipment to needy small farmers at the village level. There were more than 1167 such PACS in late 2014 as per the PSFC list (table 3.1) which ran these agri machinery service centres. Further, this was replicated in many other states more recently though not on this large scale. At the same time, many private entrepreneurs have entered custom rental space, including in Punjab. This chapter examines the operations, business model and performance of the service at the farm level in the case of PACS and a private entrepreneur in Punjab.

3.2 Methodology

Since there have already been quite a few studies on the economics of owning versus hiring farm machinery for use (e.g. Singh et al, 2013 more recently), it was decided to focus on the inclusiveness and effectiveness of various service providers in the custom rental space. In the co-operative space, a list of PACS providing this service was obtained from the state farmers commission. The table 3.1 below gives district wise presence of PACS with custom hiring facility as of late 2104. Since Bathinda had the second largest number of such PACS (9% of total and second only to Moga), it was decided to take up sample PACS from this district. Further, since it is also close to the other District (Fazilka) which has the only large scale private modern custom rental players (ZFS) and very few PACS with such services (0.5% of

total), it was an appropriate place to compare and contrast the presence and performance of the two models/types of players. Incidentally, Since Fazilka has one of the lowest presence of PACS renting out machines and equipment, which shows that the private player had a space and level playing field to operate and succeed. Thus, six PACS from Bathinda district and five ZFS franchises from Fazilka were selected for detailed study and further the farmers being serviced by these players and those not being serviced were also surveyed to examine the inclusiveness and effectiveness of the service provision. Thus, 84 farmers in all were interviewed across service providers- local, PACS, ZFS or a combination of PACS and local and ZFS and local but not ZFS and PACS as there was hardly any overlap between ZFS and PACS in the two districts. The local service provider farmers have been treated as control farmers for both PACS and ZFS farmers.

Table 3.1: District wise list of PACS with custom rental of agri machines in Punjab in 2014

District	No. of PACS	%age in total
Amritsar	75	6.43
Bathinda	**105**	**9**
Barnala	38	3.26
Fazilka	**6**	**0.51**
Faridkot	44	3.77
Firozepur	79	6.77
Fatehgarh Sahib	41	3.51
Gurdaspur	35	3
Hoshiarpur	80	6.86
Jalandhar	75	6.43
Kapurthala	57	4.88
Ludhiana	91	7.80
Mansa	46	3.94
Moga	**116**	**9.94**
Nava Shehar	56	4.80
Mukatsar	42	3.60
Patiala	66	5.66
Ropar	11	0.94
Sangrur	60	5.14
Taran Taran	33	2.83
SAS Nagar	11	0.94
Total	1167	100

Source: PSFC, 2014.

3.3 Private agri machinery rental service providers

3.31 ZFS – A profile

In 1948, imported tractor –Fordson- was purchased by Ahuja family to tide over labour shortage due to partition which led to Muslim workers moving to Pakistan. Mr. Ahuja was a dealer of ford motor company in Delhi from 1949. Imports ended approximately in 1959-60 because hard currency imports were banned. Soon after that, tractors started getting imported in soft currency from Poland Czechoslovakia, and Russia. So in 1962, Ahujas took an agency of Russian tractors. In 1972, the Punjab tractors offered them this distributorship (agency) and the first tractor from Swaraj made on 19 April 1974 came to the Ahujas. Since 40 years, they have been with the Punjab tractors which has changed many hands from Punjab tractors to another company and .then to Mahindra. Zamindara (the Ahuja Firm) has 17 outlets across three districts in Punjab, and in Rajasthan since 30 years. New Holland dealership for tractors and machines started three years back. There is no clash as the agencies are in different parts of the state and in different states of Punjab, Haryana and Rajasthan. It has 150 balers, a sugarcane harvester, rakes, pneumatic transplanter, multi crop precision planter, fertilizer broadcaster, sub soiler, fodder harvester, and maize harvester. The family also cultivates more than 375 acres across Punjab and Haryana. Basmati 1121, wheat and barley are the main crops besides citrus kinnow, and guava.

In 2000 and 2001, there was a sharp drop in demand for tractors and only replacement sales were happening and this was mainly through exchange offers where farmers replaced old one with a new one and dealers ended up with large stock of old tractors. Even second hand tractor markets had come up in some parts of the state and the Zamindara tried to sell tractors in these markets as well, but of not much avail. Because it was already there in tractor trade and by then the private (captive) finance companies had not come in to provide finance for tractor purchase and farmers had to only depend on banks for loans to buy tractors which was not easy for small holders, it thought that this was an opportunity to renovate old tractors and start giving them on rent. It also tried selling old tractors by renovating them but at that time the slump was so prevalent in the market that they were not getting sold at the desired pace. Further, the second hand market is different because the

buys wanting to buy an old tractor would buy the tractor in old shape/finishing only so that he comes to know its condition. when it started giving old tractors after repairing them then idea to start rentals came up. This was also the period of increasing labour shortage in Punjab.

It was in 2001-02, Mr Ahuja noticed that John Deere and Class New Holland (CNH) dealer lease and sell old tractors. This was new phenomenon. Mr. Vikram Ahuja also examined the possibility of applying taxi hire and use model abroad and started giving tractors on rental basis from one centre, with a few tractors. He called it the library model. But, there were occupational hazards in this model as user would change the battery before returning the tractors, change oil of rear transmission and put kerosene oil or water in that instead. This led to pitting after 4 to 6 months in the gears of that tractor as the viscosity falls. By then, about 50 people have used that tractor and it becomes difficult to find out who has done it. They used to change tyres. Then it adopted Standard operating procedures (SOPs) and a checklist of items. Then it came into equipment rentals in 2006 which earlier farmers used to arrange from within the village. But, it could not install a meter on equipment although it tried in 2005, a meter on rotavator to know how much it worked. It believed that what cannot be measured cannot be improved. Later, it developed seals, fixed Global positioning systems (GPS) on it but again a stage came when it started realizing that the whole day was spent on monitoring and the business was seasonal. And then it started employing drivers which was called the wet taxi model. It also increased the range of implements but seasonality in use led to the issue of how to make use of drivers to cut running costs. That is when the partner model was brought in. Once the driver becomes a partner, he takes care of the machines and equipment and becomes involved. Rentals also helped sell second hand tractors as running tractor on rent used to get sold fast because the customer knew that the tractor ran fine, and was in good condition.

It tried wet lease for four years which meant tractor with driver and then moved to dry lease that is tractor only and not driver. In dry lease, returns are low and the company starts charging for running time the moment the tractor leaves the company premises. Otherwise, the user says that he has done only two acres and cannot be questioned. So, it was per hour

rental and a meter was installed on the tractor. The company joined hands with Hariyali Kissan Bazaar (HKB)- a rural supermarket chain which could not be viable and has been closed down now- at seven places; wherever HKB was there it used to park tractors there so that it was closer to farmers. It parked tractors in their premises. But, there the actual customer who was marginal farmer was not benefitting. It was a shop within a Shop concept with HKB. They were so happy because their store footfalls increased because of rentals presence. HKB collaboration worked for 4 to 5 years.

It now has 22 types of machines, and the focus is not on tractorization but mechanization. It purchased 6 laser land levelers 2005-06 and 30 more next year. It had fifty tractors and sixty drivers. Dry lease did not work because of farmer playing games and wet lease did not work because drivers did not stick for long. Now there are 30 partners or franchisees.

Zamindara Farm Solutions set up in 2005 as a separate business unit now owns 170 machines which have been used by 6000 farmers over seven years across four districts with 300 km. radius from the original centre) run it as a business model in an environment of over-tractorisation of the farm sector where affordability for such costly machines is an issue and the crisis of mechanisation is seen in the presence of second hand tractor markets in the state which are held weekly or fortnightly across many *mand*i (agricultural produce wholesale market) towns and large villages. Zamindara's investment of Rs. one million in 2005 had led to a turnover of Rs. 60 million by 2011-12. It used library model and taxi model for custom hiring of machines and tractors with the library model for machines and taxi model for tractors along with drivers. This model (franchising) was adopted along with distribution of tractors by the parent company (Zamindara distributors). After 2-3 years, the franchisee pays the cost of the tractor in EMIs from revenue generated and ends up owning the tractor which is promoted as the scheme named: *Chalak Bane Maalik* (Driver becomes Owner) (table 3.2 for details).

The franchises were into custom rentals since average of three years varying from 1-5 years with one each starting in 2009, 2010, 2011, 2012 and 2014, and two of them were landless while others had small and holdings with one of them leasing land as well, operating an

average of 11 acres most of it owned in most cases (table 3.3). By occupation, they were drivers, or farmers or mechanics (table 3.4) They catered to as many as 5 village farmers on an average ranging from 3-8 villages (table 3.5) with average farmers served being 56 per year ranging from 10-200 (table 3.6). Further, they claimed that majority of the farmers taking their services were small farmers except one who reported that only about less than 50% were so (table 3.7). Season-wise, there was not much difference in use of machinery by famers in terms of number of farmers' hours of use and area covered with such use (tables 3.8 and 3.9). Very few of them rented disc harrows, cultivator, rotavator or laser leveller or power tiller or generators as they did not own them. They had more than one tractor in majority cases ranging from 2-3 with (two each having 1 and 2 tractors each) and two of them engaging drivers for tractors other than self though for season and on fixed salary or commission from rentals. Tractor was being used for an average of 850 hours per year which was close to viability norms but with wide range from 200-1500 hours showing that two of them had very viable use of the machine while others still below desirable use (table 3.10). Only four of them has disc harrow with three using it for less than 100 hours and one for 300-400 hours. Besides tractor, laser leveller, happy seeder, generator, reaper, rotavator, power tiller and seed drill were used frequently used over the year (table 3.11).

Table 3.2: Basic profile of Franchisees of ZFS

Parameter	No. of franchisees	Minimum	Maximum	Average
Working since (Years)	5	1	5	2.9
Number of drivers engaged	2	1	1	1
Own land holding (acre)	5	0	32	9.8
Leased in land (acre)	5	0	6	1.2
Operated land holding (acre)	5	0	38	11
No. of villages served	5	3	8	5
Number of farmers taking rental services/year	5	10	200	56
Season-wise custom hiring service users-Kharif (No. of farmers)	5	5	200	55
Season-wise custom hiring service use-Kharif (No. of Hours)	5	250	1800	970
Season-wise custom hiring service-Kharif (Area covered in acres)	5	50	300	170
Season-wise custom hiring service users-Rabi (No. of farmers)	5	10	200	56
Season-wise custom hiring service use-Rabi (No. of Hours)	5	450	1800	960

Season-wise custom hiring service-Rabi (Area in acres)	5	130	300	186
No. of tractors with service provider	5	1	3	1.8
HPoftractor-1	5	50	55	54
HPoftractor-2	3	35	55	45
HPoftractor-3	1	50	50	50
Tractor: Price/ Hour	5	200	220	216
Tractor: No. of hours operated per year	5	200	1500	850
No. of Disc- harrows with service provider	5	0	1	0.8
Disc-harrows: Price/hour	2	50	120	85
Disc-harrows with tractor: Price/hour	2	500	500	500
Disc-harrows: No. of hours operated/ year	4	40	300	125
No. of Rotavator with service provider	5	1	3	1.4
Rotavator: Price/Hour	2	100	300	200
Rotavator with tractor : Price/Hour	3	800	1200	1000
Rotavator: No. of hours operated per year	5	100	400	240
No. of cultivator with service provider	5	0	1	0.8
Cultivator: Price/Hour	2	25	100	62.5
Cultivator with tractor: Price/Hour	2	350	400	375
Cultivator: No. of hours operated per year	4	0	300	95
No. of laser land leveler with service provider	5	0	1	0.4
Laser leveler with Tractor: Price/Hour	2	600	600	600
Laser leveler: No. of hours operated/ year	2	400	600	500
No. of power tiller with service provider	5	0	1	0.2
Power tiller: Price/day	1	400	400	400
Power tiller: No. of hours operated/year	1	50	50	50
No. of Seed- drill with service provider	5	0	1	0.6
Seed-drill with tractor: Price/acre	3	400	400	400
Seed-drill: No. of hours operated per year	3	50	200	143.33
No. of Roto seed drill with service provider	5	0	1	0.2
Roto seed drill with tractor: Price/acre	1	900	900	900
Roto seed drill: No. of hours operated/year	1	100	100	100
No. of Happy seeder with service provider	5	0	1	0.4
Happy seeder with tractor: Price/acre	2	800	1100	950
Happy seeder: No. of hours operated/ year	2	100	180	140
No. of reaper with service provider	5	0	1	0.6
Reaper with tractor: Price/acre	3	300	300	300
Reaper: No. of hours operated per year	3	150	300	208.33
No. of generator with service provider	5	0	1	0.4
Generator: Price/day	2	800	800	800
Generator: No. of hours operated per year	2	50	500	275

Table 3.3: Distribution of franchise owners by Owned and operated land holding

Land in Acres	No. of Franchisees	Percent	Cumulative Percent
0	2 (2)	40.0 (40)	40.0
<5	1 (0)	20.0 (0)	60.0
10-25	1 (2)	20.0 (40)	80.0
> 25	1 (1)	20.0 (20)	100.0
All	5 (5)	100.0	

Note: figures in brackets are for operated land holding

Table 3.4: Distribution of ZFS franchise owners by previous occupation

Occupation	No. of Franchisees	Percent	Cumulative Percent
Tractor driver	2	40.0	40.0
Bus driver	1	20.0	60.0
Farming + Livestock	1	20.0	80.0
Farming + Agri-machinery repairing	1	20.0	100.0
Total	5	100.0	

Table 3.5: Distribution of franchisees by no. of villages being served

No. of villages	No. of franchisees	Percent	Cumulative Percent
3	1	20.0	20.0
4	2	40.0	60.0
6	1	20.0	80.0
8	1	20.0	100.0
Total	5	100.0	

Table 3.6: Distribution of ZFS franchises by Season-wise custom hiring service users -Kharif and Rabi

No. of farmers served	No. of franchisees	Percent	Cumulative Percent
<10	1	20.0	20.0(0)
10-20	1(2)	20.0(40)	40.0(40)
20-40	2(2)	40.0(40)	80.0(80)
>100	1(1)	20.0(20)	100.0(100)
Total	5	100.0	

Note; figures in brackets are for Rabi season

Table 3.7: Distribution of ZFS franchises by Proportion of small farmers using rental services

%age of small farmers (<5 acres) catered to	No. of franchisees	Percent	Cumulative Percent
100	2	40.0	40.0
75 - 99	2	40.0	80.0
25 - 50	1	20.0	100.0
Total	5	100.0	

Table 3.8: Distribution of ZFS franchises by Season-wise custom hiring service-Kharif and Rabi(No. of Hours)

No. of hours in Kharif (Rabi)	No. of franchisees	Percent	Cumulative Percent
250 - 500	1	20.0	20.0
500- 750	1	20.0	40.0
750-1000	1	20.0	60.0
1250-1500	1	20.0	80.0
>1500	1	20.0	100.0
Total	5	100.0	

Note: the figures are same for Rabi and Kharif.

Table 3.9: Distribution of ZFS franchises by Season-wise custom hiring service-Kharif and Rabi

Area served in acres	No. of franchisees	Percent	Cumulative Percent
<100	1	20.0	20.0(0)
100-200	2(3)	40.0(60)	60.0(60)
200 – 300	1(1)	20.0(20)	80.0(80)
300 – 400	1(1)	20.0(20)	100.0(100)
Total	5	100.0	

Note; figures in brackets are for Rabi season

Table 3.10: Distribution of ZFS franchises by hours tractor operated

No. of hours tractor used/year	No. of franchisees	Percent	Cumulative Percent
200 – 300	1	20.0	20.0
300 – 400	1	20.0	40.0
500- 1000	1	20.0	60.0
>1000	2	40.0	100.0
Total	5	100.0	

Table 3.11: Distribution of ZFS franchises by the Most frequently hired machine(s)/equipment(s)

Type of machine/equipment	No. of franchisees	Percent	Cumulative
Laser leveler, Happy, seeder, Reaper	1	20	20
Rotavator	2	40	60
Tractor, Rotavator	1	20	80
Tractor, Laser leveler	1	20	100
Total	5	100	

Mostly, booking was done by farmers on phone (in two franchise cases) or by personal visit to the franchisee service provider (in case of another two franchisees) and mode of payment was cash only which was either paid at the time of booking, or after service delivery or part advance and part after service and only one service provider reporting part credit provision (tables 3.12). Maintenance was not a big issue as it was partly taken care of by franchisor (ZFS) and only partly met by service provider which ranged from 15000-20000 rupees per year (table 3.13). The service providers did not promote their services in any big way other than personal contacts in two cases and in one case use of village public address system to announce the service availability during the season.

Table 3.12: Distribution of ZFS franchises by terms of payment

Method of payment	No. of franchisees	Percent	Cumulative Percent
Full Advance payment at booking	1	20	20
After service	1	20	40
Advance + After service	2	40	80
Advance +After Service + Credit	1	20	100
Total	5	100	

Table 3.13: Distribution of ZFS franchisees by maintenance cost for all machinery/equipment/year

Type and magnitude of maintenance	No. of franchisees	Percent	Cumulative Percent
Self-maintenance by franchise owner + ZFS management of serious maintenance cost	1	20	20
15,000+Tractor maintenance by ZFS	1	20	40
20,000+ Tractor maintenance by ZFS	2	40	80
No maintenance cost (New start- up)+Tractor repairing done by ZFS	1	20	100
Total	5	100	

Two of the five franchisees reported achieving viability while others still have to achieve it. It took two and four years each to reach viable operations and the other three were either into loss making or just breaking even. The main reason was that they were either new businesses or had bought some costly machines.

3.32 PACS AMSCs

Six PACS in Bathinda district and their member farmers using the custom rental services were interviewed to know the effectiveness of their operations. Of the six PACS studied, all were on an average working in this activity for five years ranging from 4-7 years and mostly started this business during 2007-2010 with majority in the last two years (2009 and 2010) and all had staff which was fulltime which averaged two varying from 1-3. Each one had at least one driver for running the service and one even having two drivers who all worked for 8 hours each and were on casual seasonal employment contract who earned anywhere from less than 5000 rupees to as much as 10000 in most cases and in one case being paid a daily wage of Rs. 150. But, all of the case study PACS catered on an average to 2 villages with some even going up to three villages. The membership of PACS ranged from 477 to 1146 with average of 750 farmer members with only one having less than 400 members. But, only 68% members were active on an average. Of all members, only 10% were making use of rental services ranging from 45-150 members across PACS. Three PACS (50%) had 50-100 members each using the services. Only in two cases non-members were also being served which numbered 100- 200 each. Among the users, in case of 3, it was claimed that all are small farmers while in other cases each, less than 25%, up to 50% and more than 75% were reported to be small farmers. The number of farmers in Kharif making use of the services was higher in terms of number of farmers, hours and acres served compared with that in Rabi (table 3.14). Further, in Kharif in 50% PACS cases, use was only by 40-60 farmers and for another 17%, for 60-100 farmers compared with 40-60 farmers in case of 50% and only less than 40 farmers in case of another 17%. In terms of number of hours and acres covered per season distribution of PACs was not very different across seasons but the average use came out to be higher in Kharif than in Rabi.

Each PACS had one or two tractors with more having only one on average. A tractor worked for 553 hours on an average ranging from just 40 hours in one case to as many as 1000 hours in another case. Only one PACS had a trailer which was hired out at much lower rate (Rs.250/day) than the going rate in the village which was Rs 400/day. Disc harrow was more common with average of 2 but some having as many as 4 of them and was used for 80-1000 hours per year across PACS with average of 372.5 hours. Most common equipment was rotavator which was there in each PACS and some having even 2 of them. This was also one of the costlier services with tractor costing Rs. 1060 per hour which was not very different from the going rate in the villages and alone Rs. 250 per hour. It was used for an average of 113 hours ranging from 30-250 hours. Cultivator was the most commonly used equipment which was available with five PACS and it was hired out at the going rate in the village and was used for 20-1000 hours per year with an average of 255 hours. Modern and popular equipment was laser land leveler which was owned by all PACS with one owning two of them. It was given at around the going rate with some lower and some others slightly higher than it and was used for 30-600 hours with average of 218 hours.

Only three PACS had a planker which was used only for 90 hours on an average. On the other hand, ridger available with only one PACS was used even less with average of only 230 hours despite it being given at going rate in the village. PACS most commonly owned seed drill with some having as many as 4 and on average 2.5 each but it was used for 95 hours per year on an average ranging from 10-240 hours. Since potato was not widely grown the area, potato planter was available with only one PACS and was leased out at the going rate and was used for only 60 hours. One PACS each also had a reaper and a drolly each with their use being for 130 hours and 650 hours each. All these PACS had availed of subsidy from PSFC of the order of 33% on major machines like tractor and equipment like rotavator and laser leveler. Further, some PACS (2) had availed of bank loan to add to their portfolio or buy machines and equipment besides subsidy while others had put their own money into these assets. One of the two had already repaid the bank loan while the other was yet to do so.

Rotavator, laser land leveler and disc harrow emerged as the most hired equipment across all the PACS with two each reporting in each category. The farmers avail of these and other equipments by mostly visiting the PACS centre (reported by 50% PACS) and also by telephone booking or advance payment booking on first come first serve basis. Payment for the service is generally some advance and some after delivery of service (67% PACS reporting that) followed by only after delivery of service and advance plus part payment after service and part credit.

But, none of the PACS tried borrowing or exchanging machines or equipment across neighbouring PACS. They were also not promoting their services specifically. While four had achieved viability, the two were still to do so. Only two of them faced competition from other players in this service business. The viability was achieved over five years by two of them and over six by another and in just 4 years by one of them. The maintenance cost ranged from a low of Rs. 15000 to a high of Rs. 60,000 per year with the latter reported by two PACS. The major problems reported in achieving viability in two PACS was delayed payment from farmers and lack of staff to provide the service.

Table 3.14: A profile of PACS AMSCs in Bathinda

Parameter	Number	Minimum	Maximum	Mean
Working as a custom-hiring service provider since (Years)	6	4	7	5.17
Number of staff working: Regular (fulltime)	5	1	3	2.20
Number of drivers working in the agency	6	1	2	1.17
Number of working hours/day for PACS rental service staff	6	8	8	8
No. of villages served by PACS AMSC	6	1	3	2
Number of PACS members	6	477	1146	750
Active members	6	312	650	513
Passive members	6	69	496	237
Number of members taking rental services every year	6	45	150	77.50
Number of non-members taking rental services every year	6	0	200	59.17
season-wise custom hiring service-Kharif (No. of farmers)	6	40	250	117.50
season-wise custom hiring service-Kharif (No. of Hours)	6	30	2000	630
season-wise custom hiring service-Kharif (Area in acres)	6	70	1200	390
season-wise custom hiring service-Rabi (No. of farmers)	6	30	240	107.50
season-wise custom hiring service-Rabi (No. of Hours)	6	30	1500	510
season-wise custom hiring service-Rabi (Area in acres)	6	80	900	331.67
No. of tractors in the society	6	1	2	1.17
HP of tractor-1	6	50	75	60
HP of tractor-2	1	55	55	55
Tractor: No. of hours operated per year	6	40	1000	553.33
No. of trailer in the society	6	0	1	.50

Trailer: Price/day	3	200	250	223.33
Trailer Going rate of the village	1	400	400	400
No. of hours trailer operated per year	3	10	700	270
No. of Disc-harrows in the society	6	0	4	2
Disc-harrow Price/Hour	2	50	50	50
Disc-harrows with tractor: Price/hour	2	700	700	700
Disc-harrow: Going rate of the village	1	80	80	80
Disc-harrows with tractor: Going rate of the village	1	800	800	800
Disc-harrows: No. of hours operated per year	4	80	1000	372.50
No. of Rotavators in the society/with service provider	6	1	2	1.17
Rotavator: Price/Hour	1	250	250	250
Rotavator with tractor : Price/Hour	5	900	1200	1060
Rotavator with tractor: Going rate of the village	5	900	1300	1080
Rotavator: No. of hours operated per year	6	30	250	113.33
No. of cultivator in the society/with service provider	6	0	2	1.17
Cultivator with tractor: Price/Hour	5	350	800	650
Cultivator: Going rate of the village	3	350	850	633.33
Cultivator: No. of hours operated per year	5	20	1000	260
No. of laser levelers in the society/with service provider	6	1	2	1.17
Laser leveler with Tractor: Price/Hour	6	500	700	575
Laser leveler: Going rate of the village	3	600	650	616.67
Laser leveler: No. of hours operated per year	6	30	600	218.33
No. of plankers in the society	6	0	1	.33
Planker with tractor: Price/Hour	2	700	700	700
Planker: No. of hours operated per year	2	30	150	90
No. of Ridgers in the society/with service provider	6	0	1	.17
Ridger with tractor: Price/ Hour	1	300	300	300
Ridger: Going rate of the village	1	300	300	300
Ridger: No. of hours operated per year	1	20	20	20
No. of Seed-drill in the society	6	1	4	2.50
Seed-drill: Price/Hours	6	30	50	46.67
Seed-drill: Going rate of the village	3	40	80	56.67
Seed-drill: No. of hours operated per year	6	10	240	95
No. of Potato planters in the society	6	0	1	.17
Potato planter: Price/hour	1	50	50	50
Potato planter: Going rate of the village	1	50	50	50
Potato planter: No. of hours operated per year	1	60	60	60
No. of reapers in the society	6	0	1	.17
Reaper with tractor: Price/acre	1	300	300	300
Reaper: No. of hours operated per year	1	130	130	130
No. of trollies in the society/with service provider	6	0	1	.17
Drolly: Price/day	1	650	650	650
Drolly: No. of hours operated per year	1	10	10	10

Two of the PACS had started machinery rentals in 2007 and 2008 each and another two each in 2009 and 2010 respectively and had generally more than 500 members with active members being less than 500 in 50% cases. They catered to less than 50 to upto 200 members each (table 3.15, 3.16, and 3.17). All of them also offered services to non-members which ranged from less than 50 to as many as 100-200 each (table 3.18). All of

them reported serving small farmers with one claiming 100% if its members being small and another 25-99% farmers being small with just one admitting that only less than 25% were small farmers (table 3.19). The figures on farmer profile show that these claims are far from reality in most cases as operated holding are very large on an average. Also, since most hired equipment is laser leveler, rotavator and the like, and general tractor owned ship is on average one, the tractor is not used that much which should be cause for concern as that is the costliest machine for a farmer.

Table 3.15: Distribution of PACS AMSCs by Number of farmer-members

No. of members	No. of PACS	Percent	Cumulative Percent
400 – 500	1	16.7	16.7
>500	5	83.3	100.0
Total	6	100.0	

Table 3.16: Distribution of PACS AMSCs by Active members

No. of active members	No. of PACS	Percent	Cumulative Percent
300 – 400	1	16.7	16.7
400 – 500	2	33.3	50.0
>500	3	50.0	100.0
Total	6	100.0	

Table 3.17: Distribution of PACS by No. of member users of rental services/ year

Member/Users	No. of PACS	Percent	Cumulative Percent
<50	1	16.7	16.7
50 – 100	3	50.0	66.7
100 – 150	1	16.7	83.3
150 – 200	1	16.7	100.0
Total	6	100.0	

Table 3.18: Distribution of PACS by No. of non-member users of rental services/year

No. of non-member users	No. of PACS	Percent	Cumulative Percent
<50	4	66.7	66.7
100- 150	1	16.7	83.3
150 - 200	1	16.7	100.0
Total	6	100.0	

Table 3.19: Distribution of PACS by Proportion of small farmers taking services

%age of small farmer users	No. of PACS	Percent	Cumulative Percent
100	3	50.0	50.0
75- 99	1	16.7	66.7
26 – 50	1	16.7	83.3
<25	1	16.7	100.0
Total	6	100.0	

Table 3.20: Distribution of PACS by Season-wise custom hiring users -Kharif

No. of users	No. of PACS	Percent	Cumulative Percent
40 – 60	3	50.0	50.0
60 – 100	1	16.7	66.7
>100	2	33.3	100.0
Total	6	100.0	

Table 3.21: Distribution of PACS by custom hiring use-Kharif (No. of Hours)

No. of Hours	No. of PACS	Percent	Cumulative Percent
<250	2	33.3	33.3
250 - 500	2	33.3	66.7
750 - 1000	1	16.7	83.3
>1500	1	16.7	100.0
Total	6	100.0	

Table 3.22: Distribution of PACS by custom hiring area covered -Kharif

Area covered in Acres	No. of PACS	Percent	Cumulative Percent
<100	1	16.7	16.7
100 - 200	2	33.3	50.0
300 - 400	1	16.7	66.7
400 - 500	1	16.7	83.3
>500	1	16.7	100.0
Total	6	100.0	

Table 3.23: Distribution of PACS by custom hiring service users-Rabi

No. of users	No. of PACS	Percent	Cumulative Percent
20 – 40	1	16.7	16.7
40 – 60	3	50.0	66.7
>100	2	33.3	100.0
Total	6	100.0	

Table 3.24: Distribution of PACS by custom hiring use-Rabi (No. of Hours)

No. of hours of use	No. of PACS	Percent	Cumulative Percent
<250	2	33.3	33.3
250 – 500	2	33.3	66.7
500 – 750	1	16.7	83.3
1250 – 1500	1	16.7	100.0
Total	6	100.0	

Table 3.25: Distribution of PACS by custom hiring service area covered-Rabi

Area covered in acres	No. of PACS	Percent	Cumulative Percent
<100	1	16.7	16.7
100 - 200	2	33.3	50.0
300 - 400	1	16.7	66.7
400 - 500	1	16.7	83.3
>500	1	16.7	100.0
Total	6	100.0	

Though there was not much difference in the use of machines and equipment was not very different across seasons (tales 3.20-3.25), the hours operated and area covered did differ to the extent that Kharif usage was somewhat higher than that in Rabi. Tractor was used much less than desired hours per year (table 3.26) and therefore, had implications for viability. Only one PACS was able to use for 100 hours which is norm for viability.

Table 3.26: Distribution of PACS by No. of hours tractor operated/ year

No. of hours of tractor use	No. of PACS	Percent	Cumulative Percent
40	1	16.7	16.7
280	1	16.7	33.3
400	1	16.7	50.0
700	1	16.7	66.7
900	1	16.7	83.3
1000	1	16.7	100.0
Total	6	100.0	

Table 3.27: Distribution of PACS by No. of hours Disc harrow operated/year

No. of hours	No. of PACS	Percent	Cumulative Percent
<100	1	16.7	25.0
100 – 200	1	16.7	50.0
200 – 300	1	16.7	75.0
>500	1	16.7	100.0
Sub-Total	4	66.7	
Total	6	100.0	

Table 3.28: Distribution of PACS by No. of hours Rotavator operated/year

No. of hours of operation	No. of PACS	Percent	Cumulative Percent
<100	2	33.3	33.3
100 – 200	3	50.0	83.3
200 – 300	1	16.7	100.0
Total	6	100.0	

Table 3.29: Distribution of PACS by price/hour of Cultivator with tractor

Price/hour	No. of PACS	Percent	Cumulative Percent
350	1	16.7	20.0
700	3	50.0	80.0
800	1	16.7	100.0
Total	5	83.3	
Total	6	100.0	

Table 3.30: Distribution of PACS by No. of hours cultivator operated/year

No. of hours	No. of PACS	Percent	Cumulative Percent
<50	1	16.7	16.7
50 - 100	3	50.0	66.7
100 - 150	1	16.7	83.3
>200	1	16.7	100.0
Total	6	100.0	

Table 3.31: Distribution of PACS by price/hour of Laser leveler with Tractor

Price/hour	No. of PACS	Percent	Cumulative Percent
500	2	33.3	33.3
550	1	16.7	50.0
600	2	33.3	83.3
700	1	16.7	100.0
Total	6	100.0	

The prices for laser levelers were lower than the going rate which was Rs. 600 for 2 and Rs. 650 for one PACS (table 3.31). Here also, only one PACS was able to reach more than 500 hour use of laser leveler (table 3.32).

Table 3.32: Distribution of PACS by no. of hours of Laser leveler operated/ year

No. of hours	No. of PACS	Percent	Cumulative Percent
<100	3	50.0	50.0
200 - 300	1	16.7	66.7
300 - 500	1	16.7	83.3
>500	1	16.7	100.0
Total	6	100.0	

Table 3.33: Distribution of PACS by No. of Seed-drills ownership

No. of seed drills	Frequency	Percent	Cumulative Percent
1	1	16.7	16.7
2	2	33.3	50.0
3	2	33.3	83.3
4	1	16.7	100.0
Total	6	100.0	

Table 3.34: Distribution of PACS by No. of hours seed drill operated/year

No. of hours operated	Frequency	Percent	Cumulative Percent
<50	3	50.0	50.0
100 - 150	1	16.7	66.7
150 - 200	1	16.7	83.3
>200	1	16.7	100.0
Total	6	100.0	

The most commonly hired equipment was rotavator, laser land leveler and laser land leveler and disc harrow together in case of two PACS each. All of them had availed of 33% subsidy from PAFC with four for tractor, laser land leveler and rotavator and two for tractor and laser leveler. The booking for service was done by farmers over phone in one case, personal visit in three cases and telephone booking along with advance payment in another case. Mostly, franchises reported that farmers paid some advance (2/3) and some after service followed by only after service and advance plus after service and credit. In most cases, it has taken five years to achieve viability for PACS in this business.

Table 3.35: Distribution of PACS by maintenance cost for all rental machinery/year

Cost in Rs.	No. of PACS	Percent	Cumulative Percent
60,000	2	33.3	33.3
15,000	1	16.7	50.0
50,000	1	16.7	66.7
25000	1	16.7	83.3
40,000	1	16.7	100.0
Total	6	100.0	

3.4 Farmer level assessment of custom rental service providers

3.41 ZFS franchise services

Most of the farmers were in age groups ranging from 21 years to 50 years, largest group being those in 21-30 year age group (36%) (table 3.36). Further, most of the farmers were from Jat Sikh caste (85%) with only 15% being from other Sikh/Hindu castes. They were largely secondary literate (57.1) followed by senior secondary (21%) (table 3.37), others being graduates or illiterates (one each). Only two had other occupations besides farming. They had owned land which was mostly in semi-medium and medium category in case of 57% with average land holding of 13 acres (table 3.38) which ranged from 0.25 acres to 52 acres but due to leasing in by such farmers (table 3.39), the operated land turned out be on an average of the order of 25 acres with 65% farmer leasing in land and which ranged from 0.25 acres to 73 acres (table 3.40). Thus, operated categories were mostly large and medium accounting for 78% of all farmers (table 3.41). Further, farmers had this land at multiple places with average plots being 2.4 ranging from 1-4 (table 3.42). Further, 2/3 of them owned tractors and some had more than one each with some owning cultivator (50%) seed drill, planker and disc harrow (28% each) and two owning combine harvesters (14%).

Table 3.36: A profile of ZFS franchise serviced farmers

Parameter	No. of farmers	Minimum	Maximum	Average
Age in years	14	18	60	35.36
Owned land (acre)	14	.25	52	12.87
Leased in (acre)	14		50	1200
Total operating land (acre)	14	.25	73	24.8750
Number of plots	14	1	4	2.43
No. of tractors	9	1	2	1.44
HP of tractor-1	9	24	90	42
HP of tractor-2	4	35	70	52.50
Area under Paddy (acre)	14	0	73	20.95
Area under Cotton (acre)	14	0	17	3.61
Area under Wheat (acre)	14	0	73	24.55
Area under other crop (acre)	14	0	3	0.32
Number of machinery taken on rent	14	1	3	1.50
Tractor-Use per season (in hours)	7	8	48	19.43
Tractor-Price per-hour	7	200	220	217.14
Rotavator-Use per season (in hours)	5	8	100	38.20
Rotavator-Price per-hour	5	100	600	340
Rotavator with Tractor-Use per season (in hours)	4	1	20	12.63
Rotavator with Tractor-Price per-hour	4	300	1200	750
Laser leveler with tractor- Use per season (in hours)	3	12	40	24
Laser leveler with tractor-Price per-hour	3	250	600	466.67
Seed drill with tractor-Use per season (in hours)	1	1	1	.50
Seed drill with tractor- Price per-hour	1	400	400	400
Reaper with tractor-Use per season (in hours)	1	20	20	20
Reaper with tractor- Price per-acre	1	300	300	300

Table 3.37: Distribution of various types of farmers by age groups

Service agency wise farmer category>	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Age group	No. of farmers	Percent	No. of farmers	Percent	No. of farmers	Percent	No .of farmers	Percent
0-20	1	7.1	1	5.9	0	0	3	11.5
21-30	5	35.7	4	23.5	6	22.2	4	15.4
31-40	4	28.6	5	29.4	10	37	6	23.1
41-50	3	21.4	2	11.8	7	25.9	10	38.5
More than 50	1	7.1	5	29.4	4	14.8	3	11.5
Total	14	100	17	100	27	100	26	100

Table 3.38: Distribution of various types of farmers by education

Service agency wise type of farmers>	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Level of education	**No. of farmers**	**Percent**	**No. of farmers**	**Percent**	**No. of farmers**	**Percent**	**No .of farmers**	**Percent**
Illiterate	1	7.1	2	11.8	6	22.2	3	11.5
Below Primary	0	0	1	5.9	2	7.4	2	7.7
Above Primary	1	7.1	2	11.8	2	7.4	2	7.7
Secondary	8	57.1	8	47.1	6	22.2	9	34.6
Sr Secondary	3	21.4	2	11.8	10	37	6	23.1
Graduate	1	7.1	2	11.8	1	3.7	4	15.4
Total	14	100	17	100	27	100	26	100

Table 3.39: Distribution of various types of farmers by Owned land

Service agency wise type of farmers >	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Land in Acres	**No. of farmers**	**Percent**	**No. of farmers**	**Percent**	**No. of farmers**	**Percent**	**No .of farmers**	**Percent**
0	0	0	0	0	0	0	2	7.7
<5	2	14.3	3	17.6	5	18.5	4	15.4
5 to 10	4	28.6	5	29.4	8	29.6	6	23.1
10 to 25	7	50	7	41.2	12	44.4	10	38.5
> 25	1	7.1	2	11.8	2	7.4	4	15.4
Total	14	100	17	100	27	100	26	100

Table 3.40: Distribution of various types of farmers by Leased in land

Service agency wise type of farmers >	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Land in Acres	**No. of farmers**	**Percent**	**No. of farmers**	**Percent**	**No. of farmers**	**Percent**	**No .of farmers**	**Percent**
0	5	35.7	13	76.5	11	40.7	13	50
<5	1	7.1	0	0	3	11.1	2	7.7
5 to 10	2	14.3	1	5.9	3	11.1	2	7.7
10 to 25	4	28.6	1	5.9	7	25.9	8	30.8
> 25	2	14.3	2	11.8	3	11.1	1	3.8
Total	14	100	17	100	27	100	26	100

Table 3.41: Distribution of various types of farmers by total operated land

Service agency wise type of farmers>	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Land in Acres	No. of farmers	Percent	No. of farmers	Percent	No. of farmers	Percent	No .of farmers	Percent
<5	1	7.1	2	11.8	2	7.4	3	11.5
5 to 10	2	14.3	6	35.3	2	7.4	3	11.5
10 to 25	7	50	5	29.4	16	59.3	15	57.7
> 25	4	28.6	4	23.5	7	25.9	5	19.2
Total	14	100	17	100	27	100	26	100

Table 3.42: Distribution of farmers by number of plots of land operated

Service agency wise type of farmers>	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
No. of plots	No. of farmers	Percent	No. of farmers	Percent	No. of farmers	Percent	No .of farmers	Percent
1	3	21.4	4	23.5	9	33.3	8	30.8
2	5	35.7	9	52.9	7	25.9	9	34.6
3	3	21.4	3	17.6	5	18.5	7	26.9
4	3	21.4	1	5.9	3	11.1	2	7.7
5	0	0	0	0	3	11.1	0	0
Total	14	100	17	100	27	100	26	100

Most of the ZFS franchisee serviced farmers (70%) had semi-medium, medium and large land holding under paddy (table 3.43) with only 21% not growing it at all. On the other hand, cotton was grown on much smaller area (semi-medium size) or not grown by a majority of the farmers at all (57%) (table 3.44). Wheat was grown by all farmers (table 3.45) as it did not compete with other crops in season unlike paddy and cotton competing with each other in the same season. Only three PACS farmers grew potato on a small area of their land ranging from less than 5 acres to 10 acres. Other crops were grown only in less than 5 acres in all categories except in case of one farmer in ZFS plus local service takers and two each in case of PACS and local and only local sources.

Table 3.43: Distribution of types of farmers by Area under Paddy

Service agency wise category of farmers	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Area under paddy in Acres	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No .of farmers*	*Percent*
0	3	21.43	2	11.76	6	22.22	7	26.92
<5	1	7.14	6	35.29	2	7.41	3	11.54
5 to 10	3	21.43	4	23.53	5	18.52	6	23.08
10 to 25	3	21.43	1	5.88	10	37.04	7	26.92
> 25	4	28.57	4	23.53	4	14.81	3	11.54
Total	14	100	17	100	27	100	26	100

Table 3.44: Distribution of various types of farmers by Area under Cotton

Service agency wise type of farmers	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Land in Acres	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No .of farmers*	*Percent*
0	8	57.14	11	64.71	9	32.14	12	46.15
<5	2	14.29	3	17.65	10	35.71	6	23.08
5 to 10	3	21.43	3	17.65	4	14.29	3	11.54
10 to 25	1	7.14	0	0	4	14.29	5	19.23
> 25	0	0	0	0	1	3.57	0	0
Total	14	100	17	100	28	100	26	100

Table 3.45: Distribution of various types of farmers by area under Wheat

Service agency wise category of farmers	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Wheat area in Acres	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No .of farmers*	*Percent*
0	1	7.1	0	0	0	0	0	0
<5	0	0	2	11.8	2	7.4	3	11.5
5 to 10	3	21.4	7	41.2	5	18.5	5	19.2
11 to 15	1	7.1	3	17.6	9	33.3	5	19.2
16 to 25	5	35.7	1	5.9	4	14.8	8	30.8
> 25	4	28.6	4	23.5	7	25.9	5	19.2
Total	14	100	17	100	27	100	26	100

ZFS franchisee serviced farmers generally hired one or two machines (64% and 21% each) with a few renting in three machines each (table 3.46). Tractor was the most common hired machine (by 50%) followed by rotavator alone or with tractor i.e. 35% and 28% each

respectively (table 3.47, 3.48 and 3.49). Tractor was hired for less than 20 hours in majority cases.

Table 3.46: Distribution of various types of farmers by no. of machines taken on rent

Agency wise type of farmers>	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
No. of machines taken on rent	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No .of farmers*	*Percent*
1	9	64.3	0	0	0	0	6	23.1
2	3	21.4	5	29.4	7	25.9	10	38.5
3	2	14.3	2	11.8	6	22.2	6	23.1
4	0	0	1	5.9	8	29.6	2	7.7
5	0	0	4	23.5	3	11.1	0	0
6	0	0	0	0	1	3.7	1	3.8
7	0	0	2	11.8	2	7.4	1	3.8
8	0	0	1	5.9	0	0	0	0
9	0	0	1	5.9	0	0	0	0
10	0	0	1	5.9	0	0	0	0
Total	14	100	17	100	27	100	26	100

Table 3.47: Distribution of ZFS franchisee farmers by custom use of tractor

Tractor use in hrs per year	No. of farmers	Percent	Cumulative Percent
<20	4	28.6	57.1
20 – 40	2	14.3	85.7
>40	1	7.1	100.0
Total	7	50.0	

Table 3.48: Distribution of ZFS franchisee served by use of rotavator

Rotavator use in hours per season	No. of farmers	Percent	Cumulative Percent
<20	2	14.3	40.0
20- 40	1	7.1	60.0
>40	2	14.3	100.0
Total	5	35.7	

Table 3.49: Distribution of farmers by custom use of rotavator with tractor

Service agency wise type of farmer>	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Use in hrs per season	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No .of farmers*	*Percent*
<10	1	7.1	4	23.5	3	11.1	1	3.8
10 to 20	1	7.1	3	17.6	2	7.4	2	7.7
20 to 30	2	14.3	1	5.9	4	14.8	1	3.8
30 to 40	0	0	1	5.9	1	3.7	2	7.7
>=40	0	0	1	5.9	2	7.4	2	7.7
Total	4	28.6	10	58.8	12	44.4	8	30.8

As against new service providers, in case of local sources, payment was made on delivery of service in majority cases (72%) and on part advance and part on delivery in 21% cases and only one farmer reporting advance and some day's credit (table 3.50). All of the farmers were satisfied with rental services rating it as good (71%) or very good (29%) and it was mainly on availability they had rated these service providers (79%) as satisfactory or the quality of service (15%). Earlier, these farmers either did not use rental machinery (50%) or used local sources (30%) only or managed through other means (20%). The major benefits of custom rentals were viable operations, lower cost and benefit of large tractor and machine availability (table 3.51) due to their infrequent use as owning them was costly and unaffordable. The major reasons for use of such services were as listed in table 3.58.

Table 3.50: Distribution of various types of farmers by methods of payment

Service agency wise category of farmers	**ZFS**		**ZFS & Local Source**		**PACS & Local Source**		**Local Source**	
Method of payment	***No. of farmers***	***Percent***	***No. of farmers***	***Percent***	***No. of farmers***	***Percent***	***No .of farmers***	***Percent***
On service	10	71.4	17	100	24	88.9	25	96.2
Advance + on delivery	3	21.4	0	0	0	0	1	3.7
Advance + After a few days	1	7.1	0	0	0	0	0	0
After a few days	0	0	0	0	1	3.7	0	0
After a few months	0	0	0	0	1	3.7	0	0
others	0	0	0	0	1	3.7	0	0
Total	14	100	17	100	27	100	26	100

Table 3.51: Distribution of various types of farmers by benefits of custom hiring

Service agency wise farmer category	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Type of benefit	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No. of farmers*	*Percent*	*No .of farmers*	*Percent*
Viability	7	50	3	17.6	0	0	3	11.5
Lower cost	2	14.3	3	17.6	12	44.4	13	50
Better for small farm than owning	0	0	3	17.6	1	3.7	5	19.2
Viability + Infrequent use	0	0	1	5.9	3	11.1	0	0
Infrequently use	0	0	0	0	0	0	1	3.8
Speedily work	1	7.1	0	0	0	0	0	0
Availability of high HP-tractors with heavy machines	1	7.1	0	0	0	0	0	0
Viability +No hassle of repairing and maintenance	0	0	1	5.9	0	0	0	0
Lower cost +No hassle of repairing and maintenance	1	3.7	0	0	0	0	0	0
Viability +Availability of high HP-tractors with heavy machines	2	14.3	0	0	0	0	0	0
Viability +Speedily	0	0	2	11.8	1	0	0	0
Lower cost + Infrequent use	1	7.1	1	5.9	10	37	2	7.7
Lower cost +Availability of high HP-tractors with heavy machines	0	0	1	5.9	0	0	1	3.8
Lower cost +Speedily	0	0	0	0	0	0	1	3.8
Lower cost +No hassle of repairing and maintenance	0	0	2	11.8	0	0	0	0
Lower cost +Availability of high HP-tractors with heavy machines	0	0	1	5.9	0	0	0	0
Total	16	100	17	100	27	100	26	100

Table 3.52: Distribution of various types of Farmers by Reason for use of different sources

Service agency wise category of farmers> Reason for use	ZFS		ZFS & Local Source		PACS & Local Source		Local Source	
Availability	9	64.3	6	35.3	17	63	17	65.4
Nearness	1	7.1	0	0	0	0	0	0
Timely service	1	7.1	0	0	0	0	0	0
Availability +relationship	1	7.1	0	0	1	3.7	3	11.5
Availability +less price	1	7.1	0	0	1	3.7	0	0
Availability +Good service	1	7.1	0	0	1	3.7	0	0
Availability +Timely service	0	0	3	17.6	1	3.7	1	3.8
Availability +Nearness	0	0	8	47.1	6	22.2	5	19.2
Total	14	100	17	100	27	100	26	100

Only three farmers (21%) had got their soil tested from private or government agencies and only three had gone for water testing from private agencies or the state agri university. Source of advice in majority cases who sought advice was private companies (85%) with majority not seeking nay formal advice. The major benefit sought for this advice was yield increase and such other benefits.

3.42 ZFS and Local source farmers

These farmers used both ZFS and local custom rental services. They were generally smaller than their ZFS counterparts both in owned and operated land on an average which ranged from 2-30 acres and 2-52 acres respectively (table 3.53). They were younger in age, had smaller number of plots of land and lesser ownership of tractors. Though they had smaller cropped area of wheat, paddy and cotton as they had lower operated holdings, they hired in many more machines and equipment than their ZFS exclusive counterparts. This shows that ZFS caters to both large and small farmers depending on the local area and the franchisee operations.

Table 3.53: A Profile of ZFS and local service user farmers

Parameter	No. of farmers	Minimum	Maximum	Average
Age	17	20	65	40.76
Owned land (acre)	17	2	30	11.8824
Leased in (acre)	17		40	5.5882
Leased out (acre)	17		10	0.5882
Total operated land (acre)	17	2	52	16.8824
Number of plots	17	1	4	2.06
No. of tractors	10	1	2	1.2

HP of tractor-1	10	24	55	43.1
HP of tractor-2	2	24	30	27
Area under Paddy (acre)	17	0	52	13.59
Area under Cotton (acre)	17	0	10	2.29
Area under Wheat (acre)	17	2	52	16.41
Area under other crop (acre)	17	0	8	1
Number of machines taken on rent	17	2	10	4.76
Tractor-Use per season (in hours)	8	10	100	30.62
Tractor-Price per-hour	8	200	220	210
Disc harrow-Use per season (in hours)	2	3	3	3
Disc harrow- Price per-hour	2	50	120	85
Rotavator-Use per season (in hours)	3	3	20	11
Rotavator-Price per-hour	3	100	120	106.67
Seed drill-Use per season (in hours)	1	2	2	2
Seed drill-Price per-hour	1	100	100	100
Combine SP-Use per season (in Hours)	17	2	100	13.47
Combine SP-Price per-acre	17	600	1300	1035.29
Trolley with tractor-Use per season (in hours)	3	2	12	6
Trolley with tractor-Price price for one time use	3	500	800	600
Disc-harrow with tractor-Use per season (hrs)	3	3	4	3.67
Disc-harrow with tractor-Price per-hour	3	400	500	450
Rotavator with Tractor-Use per season (hours)	10	2	50	16.6
Rotavator with Tractor-Price per-hour	10	300	1250	815
Cultivator with Tractor-Use per season (hours)	3	2	3	2.67
Cultivator with Tractor- Price per-hour	3	450	1000	633.33
Laser leveler with tractor- Use/ season (hours)	13	2	52	14.38
Laser leveler with tractor-Price per-hour	13	500	1000	615.38
Seed drill with tractor-Use per season (in hours)	8	2	30	8.75
Seed drill with tractor- Price per-hour	8	400	1000	637.5
Reaper with tractor-Use per season (in hours)	7	1	100	20.57
Reaper with tractor- Price per-acre	7	300	400	350
Thresher with tractor- Use per season (in hours)	2	4	4	4
Thresher with tractor- Price per-hour	2	700	1000	850

These ZFS plus local service farmers was secondary and above literate (table 3.38) with 70% of them being so and had medium and semi-medium holdings (table 3.39) of their own (79%) and 88% holdings in these categories after leased in land was taken into account (table 3.41). Only one farmer had leased out large acreage of land (6% of all farmers). 50%

of them had two or less plots and average being just 2 compared with ZFS who has 2.4 plots on an average (table 3.42).

These farmers had generally grown paddy except 12% and very few grew cotton (35%) while wheat was grown by all of them (table 3.43, 3.44 and 3.45). Only three of them grew other crops. They hired multiple machines ranging from 2-10 with most frequent number being 2 and 5 and average being about 5 machines (table 3.46). Combine was used by all of them (table 3.54) and tractor by 50% of them for 20-40 hours (table 3.55) unlike their ZFS exclusive ones who used it only for less than 20 hours each.

Table 3.54: Distribution of ZFS and local source farmers by use of combine harvester

Use in hrs per season	No. of farmers	Percent	Cumulative Percent
<10	10	58.8	58.8
10-20	5	29.4	88.2
20-30	1	5.9	94.1
>=40	1	5.9	100.0
Total	17	100.0	

Table 3.55: Distribution of ZFS and local source farmers by use of tractor

No. of hours of tractor use/season	No. of farmers	Percent	Cumulative Percent
<20	2	11.8	25.0
20-40	5	29.4	87.5
>40	1	5.9	100.0
Total	8	47.1	

Table 3.56: Distribution of ZFS/local source users by charges for SP combine

Price per acre in Rs.	No. of farmers	Percent	Cumulative Percent
<1000	3	17.6	17.6
1000 - 1200	13	76.5	94.1
>1200	1	5.9	100.0
Total	17	100.0	

59% of farmers reported use of rotavator with tractor and 77% farmers used laser land leveler with tractor. Further, 47% farmers used seed drill with tractor by hiring it in. The rotavator with tractor was used only for up to 20 hours in majority (70%) of users. Further, there was larger range of price charged varying from less than 500 rupees to more than Rs.

1000 per hour but modal prices (60% cases) were between 500-1000 rupees per hour. Both rotavator and laser leveler had large range of usage across farmers.

Table 3.57: Distribution of ZFS and local source farmers by use of laser leveler

Use in hours /season	No. of farmers	Percent	Cumulative Percent
<10	7	41.2	53.8
10-20	1	5.9	61.5
20-30	3	17.6	84.6
30-40	1	5.9	92.3
>=40	1	5.9	100.0
Total	13	76.5	

Most of the farmer paid Rs 500-700 per hour for rotavator use with only 15% paying more than Rs. 700 per hour. Seed drill was used by 47% farmers with varying hours of use ranging from less than five hours per season to as many as more than 10 hours and the charges per hour were more between Rs. 400-700 and only less than half reported more than Rs. 700 per hour. Except one, all of the farmers found the service good or very good and the reason for that was adequate availability of the service in 88% cases. Previously, 30% farmers had not used rental service, another 35% each had used local sources and relied on other means of getting mechanised services. Major benefits of custom hiring included lower cost and therefore more viable farming operations suited for small holders, speedy completion of work, and no hassle of maintaining the machines and equipment (table 3.51). Major reasons for use by ZFS and local source farmers for use of ZFS franchisee services were availability and nearness of service (47%), only availability (35%) and timely availability of service (18%).

3.43 Farmer level assessment of PACS services

In general, the PACS service using farmers were not that large with average owned holding of the order of 12 acres and operated size of 19 acres ranging from complete landless and operating just four acres of leased land to as much as 43 acres of owned and 45 acres of operated land. On average, the land was in 2.4 plots and average number of tractors was 1.22 with four farmers not having tractors at all (15% of total). Some of them did not grow paddy and cotton at all and others average of 13 and 4 acres (table 3.58). Every farmer grew wheat and average of 17 acres. Interestingly, on average they hired 3.6 machines from PACS centres and they mostly used non-tractor equipment or tractor with equipment if they

did not have tractor followed by laser leveler. Rotavator was the most used equipment and sand the costlier per hour followed by combine harvester.

Table 3.58: A profile of PACS and Local Source Custom hiring farmers

Parameter	No. of farmers	Minimum	Maximum	Average
Age	27	22	62	39.63
Owned land (acre)	27	2	43	12.2963
Leased in (acre)	27		40	8.2963
Leased out (acre)	27		28	1.4815
Total operating land (acre)	27	4	45	19.1111
Number of plots	27	1	5	2.41
No. of tractors	23	1	2	1.22
HP of tractor-1	23	25	60	44.35
HP of tractor-2	5	25	60	45.40
Area under Paddy (acre)	27	0	38	13.09
Area under Cotton (acre)	27	0	16	4.48
Area under Wheat (acre)	27	4	44	17.67
Area under Potato (acre)	27	0	6	.33
Area under other crop (acre)	27	0	16	1.83
Number of machinery taken on rent	27	2	7	3.67
Disc harrow-Uses per season (in hours)	9	12	70	34.44
Disc harrow- Price per-hours	9	45	70	58.33
Rotavator-Uses per season (in hours)	7	5	30	17.43
Rotavator-Price per-hour	7	100	500	207.14
Seed drill-Uses per season (in hours)	6	4	26	10.17
Seed drill-Price per-hour	6	40	50	48.33
Combines SP-Uses per season (in Hours)	16	6	80	19.50
Combines SP-Price per-acre	16	800	1500	1012.50
Combines (Tractor operated)-hrs Use per season	11	2	20	9.27
Combines (Tractor operated)- Price per-acre	11	650	1200	950
Disc-harrow with tractor-hrs Use per season	4	5	24	12.75
Disc-harrow with tractor-Price per-hour	4	700	900	750
Rotavator with Tractor-hrs Use per season	12	3	45	20.67
Rotavator with Tractor-Price per-hour	12	900	1200	1066.67
Cultivator with Tractor-hrs Use per season	3	5	20	11.67
Cultivator with Tractor- Price per-hour	3	300	700	433.33
Laser leveler with tractor- hrs Use per season	22	5	40	17.41
Laser leveler with tractor-Price per-hour	22	450	700	572.73
Seed drill with tractor-Uses per season (in hours)	2	3	6	4.50
Seed drill with tractor- Price per-hour	2	500	700	600
Reaper with tractor-Uses per season (in hours)	1	12	12	12
Reaper with tractor- Price per-acre	1	300	300	300
Straw-reaper with tractor- hrs Use per season	6	12	70	36.33
Straw-reaper with tractor-Price per-acre	6	1400	1700	1583.33

The farmers in this category were mostly in age groups of 21-50 like their other counterparts with 15% being above 50 years of age (table 3.37) most were Jat Sikh and caste and religion and secondary and senior secondary education was the most common (60%) with only one being a graduate (table 3.38). Except one, no-one had any other occupation. 41% did not lease in any land (table 3.40) and 89% did not lease out any. Only three PACS farmers leased out some land ranging from less than five acres to as much as more than 25 acres. Finally, in operations categories, only 2 were small and two medium with the rest 85% either medium or large category land operators with as many as up to 5 plots with average being 2.4 (tables 3.39 and 3.41).

Table 3.59: Distribution of PACS and Local Source farmers by disc harrow-Use/season

Use per season in hours	Frequency	Percent	Cumulative Percent
<20	2	7.4	22.2
20- 40	5	18.5	77.8
>40	2	7.4	100.0
Total	9	33.3	

Disc harrow price was Rs. 50-70 per hour with one reporting less than Rs. 50. Rotavator was used by only 7 farmers with 4 for less than 20 hours per season and the other three for 20-40 hours each with price per hours being less than 300 rupees in case of five and 300-500 rupees for two. Only 6 farmers used seed drill with five using only for less than 20 hours per season and one for 20-40 hours.

Table 3.60: Distribution of PACS and Local Source farmers by Combine SP-Use

Combine use in hours per season	No. of farmers	Percent	Cumulative Percent
<10	6	22.2	37.5
10 – 20	7	25.9	81.3
30- 40	1	3.7	87.5
>=40	2	7.4	100.0
Total	16	59.3	

Table 3.61: Distribution of PACS and Local Source farmers by combine SP-Price per-acre

Charges in Rs.	No. of farmers	Percent	Cumulative Percent
<1000	5	18.5	31.3
1000 - 1200	10	37.0	93.8
>1200	1	3.7	100.0
Total	16	59.3	

Table 3.62: Distribution of PACS and Local Source farmers by Combine (Tractor operated)-Use

Use in hours per season	No. of farmers	Percent	Cumulative Percent
<10	6	22.2	54.5
10 – 20	4	14.8	90.9
20 – 30	1	3.7	100.0
Total	11	40.7	

The tractor operated combine charged Rs. 1000-1200 per acre in case of 7 farmers and less than Rs. 1000 in case of other four. Disc harrow with tractor which was used only by four farmers cost Rs. 400-700 mostly with one farmer reporting more than Rs.700 per hour.

Table 3.63: Distribution of PACS and Local Source farmers by Disc-harrow with tractor-Use/season

Disc harrow use (in hours)	No. of farmers	Percent	Cumulative Percent
<10	1	3.7	25.0
10- 20	2	7.4	75.0
>20	1	3.7	100.0
Total	4	14.8	

Half of tractor driven rotavator paid more than Rs.1000 while other half reported paying between Rs. 500-1000 per hour. Cultivator with tractor was used only by three farmers and only for 5-10 hours by two with only one using it for more than 10 hours and the hiring charges were Rs. 300-500 per hour in two cases and more Ethan Rs. 500 in one case.

Table 3.64: Distribution of PACS and Local Source farmers by Laser leveler with tractor- Use

Use in hours per season	No. of farmers	Percent	Cumulative Percent
<10	6	22.2	27.3
10- 20	8	29.6	63.6
20- 30	3	11.1	77.3
30- 40	4	14.8	95.5
>=40	1	3.7	100.0
Total	22	81.5	

The charges for laser levelers which was one of the most commonly hired machine was Rs. 500-700 per hour in most cases with just two farmers reporting less than Rs. 500. Straw reaper with tractor was used only by 6 farmers with 2 each using it for less than 20 hours, 20-40 hours and more than 40 hours each. Farmers mostly paid on delivery of service in 89% cases and the others paying after a few days or a few months (table 3.50).

96% of the farmers were satisfied with the service with 11% rating it very good and other as good and only one farmer rating it poor. The reason for satisfaction was good availability

of service in 93% cases. Earlier , most of them used only local sources and few reporting other means like relatives and other sources with only one reporting PACS as the earlier source as well (table 3.65). Lower cost was a major benefit of the PACS service as it was for local source (table 3.52). Also, availability for infrequent use was a good reason as it would be difficult to buy a machine for infrequent use. Availability and proximity were the major reasons for use of service from PACS and local sources.

Table 3.65: Distribution of PACS and Local Source farmers by source of custom service earlier

Earlier source	No. of farmers	Percent	Cumulative Percent
Local source	19	70.4	70.4
PACS + Local source	1	3.7	74.1
No used earlier	2	7.4	81.5
others	5	18.5	100.0
Total	27	100.0	

Only 55% of farmers reported seeking advice on input use and that was mostly from private agency (45%) followed by PACS and govt. agencies which was found useful for knowing more about inputs and in some cases yield increase. Only 15% reported being part of field demons organised by only private agencies which informed them of varieties of seeds and input use on them. Govt. agencies figured as the second source for information on agri inputs alongside PACS besides private agencies but overall only 22% farmers reporting that which was beneficial for purchase and use of agro inputs. Most farmers (82%) had been to farmer fairs organised by state agri university and found that they learnt about new varieties of seeds and about other agro inputs.

Table 3.66: Distribution of PACS and Local Source farmers by benefits of Advice on input use

Benefit	No. of farmers	Percent	Cumulative Percent
No response	12	44.4	44.4
Yield increase	3	11.1	55.6
Knowledge about agro-inputs	8	29.6	85.2
others	4	14.8	100.0
Total	27	100.0	

3.44 Local source custom hiring farmers

This set of farmers was also generally smaller landholders or operators than their ZFS counterparts and had this land in just two places on an average. They had one tractor with them on an average and hired only two machines each ranging from 2-7 (table 3.67).

Table 3.67: A profile of farmer using local custom rentals machinery and equipment services

Parameter	Total Number of farmers	Minimum	Maximum	Average
Age	26	17	62	39
Owned land (acre)	26		60	14.2212
Leased in (acre)	26		35	5.5769
Leased out (acre)	26		20	1.1538
Total operating land (acre)	26	.25	50	18.6442
Number of plots	26	1	4	2.12
No. of tractors	25	1	2	1.08
HP of tractor-1	25	25	60	42.44
HP of tractor-2	2	35	35	35
Area under Paddy (acre)	26	0	45	11.75
Area under Cotton (acre)	26	0	25	5.92
Area under Wheat (acre)	26	2	48	18.33
Area under other crop (acre)	26	0	27	1.42
Number of machinery taken on rent	26	1	7	2.50
Disc harrow-Uses per season (in hours)	1	3	3	2.50
Disc harrow- Price per-hours	1	50	50	50
Rotavator-Uses per season (in hours)	4	8	80	35.50
Rotavator-Price per-hour	4	250	600	487.50
Seed drill-Uses per season (in hours)	1	3	3	3
Seed drill-Price per-hour	1	50	50	50
Combines SP-Uses per season (in Hours)	18	2	25	11.39
Combines SP-Price per-acre	18	600	1300	1011.11
Combines (Tractor operated)-Uses per season (in Hours)	4	3	10	6
Combines (Tractor operated)- Price per-acre	4	900	1000	975
Trolley with tractor-Uses per season (in hours)	1	4	4	4
Trolley with tractor-Price price for one time use	1	1200	1200	1200
Disc-harrow with tractor-Uses per season (in hours)	2	1	12	6.25
Disc-harrow with tractor-Price per-hour	2	400	450	425
Rotavator with Tractor-Uses per season (in hours)	8	5	100	31.50
Rotavator with Tractor-Price per-hour	8	300	1250	943.75
Cultivator with Tractor-Uses per season (in hours)	2	1	5	2.75

Cultivator with Tractor- Price per-hour	2	300	400	350
Laser leveler with tractor- Uses per season (in hours)	17	2	100	24.59
Laser leveler with tractor-Price per-hour	17	500	650	570.59
Seed drill with tractor-Uses per season (in hours)	3	1	6	4.17
Seed drill with tractor- Price per-hour	3	200	500	400
Reaper with tractor-Uses per season (in hours)	1	6	6	6
Reaper with tractor- Price per-acre	1	400	400	400
Straw-reaper with tractor- Uses per season (in hours)	3	4	30	16
Straw-reaper with tractor-Price per-acre	3	1400	1700	1500

They were generally younger in age with 39 years as the average age and were secondary or above literate two of them were landless lease farmers and most were in semi medium and semi-medium category in ownership and medium and large in operated terms, with average owned and operated land being 14 and 19 acres each respectively.

Only two farmers had leased out land and that was in the range of 10-25 acres each. Interestingly, 30% of them did not grow paddy and 50% did not grow cotton while all growing wheat (table 3.67). Only three farmers reported growing other crops in area ranging from less than 5 acres to as much as 5-10 acres and more than 25 acres each.

Rotavator was hired by only 15% and for less than 20 hours per season by two of the four and by 20-40 hrs and more than 40 hours by another each. It was being charged from less than 300 rupees in one case to more than Rs. 500 in another case with others reporting between these two figures.

Combine (SP) was most commonly used with 70% farmers reporting that and for various durations as table below shows. Only four farmers (15%) reported use of tractor driven combine harvester which was used for less than 10 hours in most cases and cost was similar to the modal charges of the SP combines. 31% farmers used rotavator with tractor and it was one of the more used equipments. The usage and prices are given in the table below.

Table 3.68: Distribution of Local source Farmers by Combine SP-Uses

Use in hours/ season	No. of farmers	Percent	Cumulative Percent
<10 Hours	6	23.1	33.3
10 Hours - 20 Hours	10	38.5	88.9
20 Hours - 30 hours	2	7.7	100.0
Total	18	69.2	

Table 3.69: Distribution of Local source Farmers by Combine SP-service Price

Rental price (Rs.) per acre	No. of farmers	Percent	Cumulative Percent
<1000	6	23.1	33.3
1000 – 1200	10	38.5	88.9
>1200	2	7.7	100.0
Total	18	69.2	

Table 3.70: Distribution of Local source Farmers by Rotavator with Tractor-Price paid

Price in Rs. per hour	No. of farmers	Percent	Cumulative Percent
<500	1	3.8	12.5
500 – 1000	3	11.5	50.0
>1000	4	15.4	100.0
Total	8	30.8	

Only two farmers (8%) used cultivator with tractor and for only less than five or just 5-10 hours. Here again, leaser levelers was the most commonly used equipment with 65% farmer doing that and with varying usage as table 3.84 below shows.

Table 3.71: Distribution of Local source Farmers by Laser leveler with tractor- Use per season

Use in hours/season	No. of farmers	Percent	Cumulative Percent
<10	6	23.1	35.3
10- 20	3	11.5	52.9
20 – 30	4	15.4	76.5
>=40	4	15.4	100.0
Total	17	65.4	

Only 3 farmers (about 11%) used straw reaper and just for less than 20 hours and in one case 20-40 hours. All farmers rated custom service as good (89%) and very good (11%) mainly due to easy availability. A quarter of them did not use agri machinery earlier and another 35% managed otherwise with 42% being users of local sources earlier too. Major benefits reported were lower cost, suited for small holders and viable operations in that order (table 3.52).

Only 23% of them reported seeking any advice on use of agri inputs and sources were mostly private agencies (in 66% cases), and Govt., and PACS to some extent (17% each)

mainly sought for yield increase and for general learning. Field demons were experienced by only two farmers (8%) and only from private agencies. Only two farmers (8%) reported receiving information from govt. agencies for better knowledge on agri inputs. Agri Fairs were the major source of new information which was so for a majority (61%) of farmers and for its benefits like information on new seed varieties and other new products.

3.5. Summary

The franchises were into custom rentals since average of 3 years varying from 1-5 years and two of them were landless while others had small and holdings with one of them leasing land as well, operating an average of 11 acres most of it owned in most cases. By occupation, they were drivers, or farmers or mechanics. They catered to as many as 5 village farmers on an average ranging from 3-8 villages with average farmers served being 56 per year ranging from 10-200. Mostly, booking was done by farmers on phone or by personal visit to the franchisee service provider and mode of payment was cash only which was either paid at the time of booking, or after service delivery or part advance and part after service and only one service provider reporting part credit provision. Maintenance was not a big issue as it was partly taken care of by franchisor (ZFS) and only partly met by service provider. Two of the five franchisees reported achieving viability while others still have to achieve it. It took 2 and 4 years each to reach viable operations and the other three were either into loss making or just break-even. The main reason was that they were either new businesses or had bought some costly machines.

Of the 6 PACS studied, all were on an average working in this activity for 5 years ranging from 4-7 years and mostly started this business during 2007-2010 with majority in the last two years (2009 and 2010) and all have staff which was fulltime which average 2 varying from 1-3. Each one had at least one driver for running the service. The membership of PACS ranged from 477 to 1146 with average of 750 farmer members with only one having less than 400 members. But, only 68% members were active on an average. Of all members, only 10% were making use of rental services ranging from 45-150 members across PACS. Three PACS (50%) had 50-100 members each using the services. Each

PACS had one or two tractors with more having only one on average. A tractor worked for 553 hours on an average ranging from just 40 hours in one case to as many as 1000 hours in another case. Only one PACS had a trailer.

Seed drill was the most commonly owned equipment by PACS with some having as many as 4 and on average 2.5 each but it was used for 95 hours per year on an average ranging from 10-240 hours. Since potato was not widely grown the area, potato planter was available with only one PACS and was leased out at the going rate and was used for only 60 hours. One PACS each also had a reaper and a drolly each with their use being for 130 hours and 650 hours each. All these PACS had availed of subsidy from PSFC of the order of 33% on major machines like tractor and equipment like rotavator and laser leveler. Further, some PACS (2) had availed of bank loan to add to their portfolio or buy machines and equipment besides subsidy while others had put their own money into these assets. One of the two had already repaid the bank loan while the other was yet to do so.

Rotavator, laser land leveler and disc harrow emerged as the most hired equipment across all the PACS with two each reporting in each category. The farmers avail of these and other equipments by mostly visiting the PACS centre (reported by 50% PACS) and also by telephone booking or advance payment booking on first come first serve basis. Payment for the service is generally some advance and some after delivery of service (67% PACS reporting that) followed by only after delivery of service and advance plus part payment after service and part credit.

But, none of the PACS tried borrowing or exchanging machines or equipment across neighbouring PACS. They were also not promoting their services specifically. While four had achieved viability, the two were still to do so. Only two of them faced competition from other players in this service business. The viability was achieved over 5 years by two of them and over six by another and in just 4 years by one of them. The maintenance cost ranged from a low of Rs. 15000 to a high of Rs. 60,000 per year with the latter reported by two PACS. The major problems reported in achieving viability in two PACS was delayed payment from farmers and lack of staff to provide the service.

All of them reported serving small farmers with one claiming 100% if its members being small and another 25-99% farmers being small with just one admitting that only less than 25% were small farmers. The surveyed user farmer profile showed that these claims are far from reality in most cases as operated holding are very large on an average. Also, since most hired equipment is laser leveler, rotavator and the like, and general tractor owned ship is on average one, the tractor is not used that much which should be cause for concern as that is the costliest machine for a farmer.

ZFS franchisee served farmer operated holdings were mostly large and medium accounting for 78% of all farmers. Further, farmers had this land at multiple places with average plots being 2.4 ranging from 1-4. Further, 2/3 of them owned tractors and some had more than one each with some owning cultivator (50%) seed drill, planker and disc harrow (28% each) and two owning combine harvesters (14%). These ZFS and local custom rental service user farmers were generally smaller than their ZFS counterparts both in owned and operated land on an average which ranged from 2-30 acres and 2-52 acres respectively. They were younger in age, had smaller number of plots of land and lesser ownership of tractors. Though they had smaller cropped area of wheat, paddy and cotton as they has lower operated holdings, they hired in many more machines and equipment than their ZFS exclusive counterparts. This shows that ZFS caters to both large and small farmers depending on the local area and the franchisee operations. They hired multiple machines ranging from 2-10 with most frequent number being 2 and 5 and average being about 5 machines. Combine was used by all of them and tractor by 50% of them for 20-40 hours unlike their ZFS exclusive ones who used it only for less than 20 hours each.

Most of the ZFS franchisee serviced farmers (70%) had semi-medium, medium and large land holding under paddy with only 21% not growing it at all. On the other hand, cotton was grown on much smaller area (semi-medium size) or not grown by a majority of the farmers at all (57%). All farmers grew wheat as it did not compete with other crops in season unlike paddy and cotton competing with each other in the same season. Only three PACS farmers grew potato on a small area of their land ranging from less than 5 acres to 10

acres. Other crops were grown only in less than 5 acres in all categories except in case of one farmer in ZFS plus local service takers and two each in case of PACS and local and only local sources.

ZFS franchisee serviced farmers generally hired one or two machines (64% and 21% each) with a few renting in three machines each. Tractor was the most common hired machine (by 50%) followed by rotavator alone or with tractor i.e. 35% and 28% each respectively. Tractor was hired for less than 20 hours in majority cases.

In general, the PACS service using farmers were not that large with average owned holding of the order of 12 acres and operated size of 19 acres ranging from complete landless and operating just four acres of leased land to as much as 43 acres of owned and 45 acres of operated land. Except one, no one had any other occupation. 41% did not lease in any land and 89% did not lease out any. Only three PACS farmers leased out some land ranging from less than five acres to as much as more than 25 acres. Finally, in operations categories, only 2 were small and two medium with the rest 85% either medium or large category land operators with as many as up to 5 plots with average being 2.4. The average number of tractors was 1.22 with four farmers not having tractors at all (15% of total). Some of them did not grow paddy and cotton at all and others average of 13 and 4 acres respectively. Every farmer grew wheat and average of 17 acres. Interestingly, on average they hired 3.6 machines from PACS centres and they mostly used non-tractor equipment or tractor with equipment if they did not have tractor followed by laser leveler. Rotavator was the most used equipment and sand the costlier per hour followed by combine harvester.

96% of the PACS farmers were satisfied with the service with 11% rating it very good and other as good and only one farmer rating it poor. The reason for satisfaction was good availability of service in 93% cases. Earlier , most of them used only local sources and few reporting other means like relatives and other sources with only one reporting PACS as the earlier source as well. Lower cost was a major benefit of the PACS service as it was for local source. Also, availability for infrequent use was a good reason as it would be difficult to buy a machine for infrequent use. Availability and proximity were the major reasons for use of service from PACS and local sources.

As against new service providers, in case of local sources, farmers were also generally smaller land holders or operators than their ZFS counterparts and had this land in just two places on an average. Only two farmers had leased out land and that was in the range of 10-25 acres each. Interestingly, 30% of them did not grow paddy and 50% did not grow cotton while all growing wheat. They had one tractor with them on an average and hired only two machines each ranging from 2-7 payment was made on delivery of service in majority cases (72%) and on part advance and part on delivery in 21% cases and only one farmer reporting advance and some day's credit. All of the farmers were satisfied with rental services rating it as good (71%) or very good (29%) and it was mainly on availability they had rated these service providers (79%) as satisfactory or the quality of service (15%). Earlier, these farmers either did not use rental machinery (50%) or used local sources (30%) only or managed through other means (20%).

The above examination of the business models of the two agencies in custom rentals of machinery and equipment in Punjab shows that there is plenty of demand for such services from small farmers in general and from other categories of farmers also for some costly machines which cannot be owned at the individual farmer level. The use of PACS has been an innovative move on the part of the PSFC as it is a local level member based agency which is known for its farmer linkage as it also supplies fertilisers and working capital loans to member farmers. The farmer level analysis of their services across types of farmers – both ZFS, local individual sources, PACS and other combinations shows that across all cases, farmers are generally happy using services though in some cases there are issue of price of service or timely availability as the sowing or harvesting windows are short. There is a need to encourage this practice across all states and regions with proper incentivisation of service for providers as it is really the most effective way of cutting cost of farm production and making operations more efficient and therefore increase yields as well. There should also be rationalisation of equipment keeping in mind the local needs of small farmers. Further, more services could be added or local machine owners could be encouraged to deposit their machines to such centers for their use when idle to cope up with the shortage of certain machines in peak demand season.

Chapter 4

Rural Supermarkets and Agri input markets in Uttar Pradesh

4.1 Introduction: Context, Profile and business model of Hydric

There are 42000 traditional input retailers, 10000 state run stores including co-operatives and a few hundred modern retail stores in UP which sell agri inputs. Further, co-operative and state stores provide 62% of fertilisers with another 35% being supplied by private traditional stores and 5% by modern stores (Reardon et al, 2011). It is also important to note that the larger players like Hariyali Kisan Bazaar (HKB) of DCM-Shriram and Triveni Khushali Bazaar of Triveni Enginnering which made a pioneering entry in this sector in the State have shut shop within a few years of operations. Therefore, it is very important to understand what makes Khushali Krishi Kendras (K3) stores viable and sustainable also to examine whether they have been inclusive and effective as UP is dominated by marginal and small farmers. In this context, this chapter assesses the performance of a local agri supplies supermarket chain- Khushali Krishi Kendras (KKK) operated by Hydric Farm Inputs Pvt. Ltd.

Khushali Krishi Kendras (K3) are run by Hydric Farm Inputs Limited which is an enterprise of Rohtas Enterprises based in Lucknow. The Rohtas group is a real estate group. The hydric farm inputs was registered in late 2003 at the time when HKB was already operating in Uttar Pradesh. There was also another player – Triveni Engineering- operating Khushali Kisan Bazar in the State. This group had sugar mill in the area. The basic purpose of Hydric was to capture 5-10% of the market by operating in the relative interiors of rural Uttar Pradesh where there was low or no competition. It basically focused on trading of farm inputs supported by technical guidance to the farmers especially on seeds. The intention was to improve yields and lower cost of production. In sugarcane, it came up with a new product called sugar pack, jointly with uniphos of UPL.

The first outlet was opened at Karanpur in late October 2004 followed by another one in Sitapur which was under an arrangement with Hindustan Petroleum Corporation Limited (HPCL) unlike the first one which was owned. All of these stores are company operated but

have been acquired mostly under lease arrangements from different players like HPCL, *Mandi Parishad* (market council) and the former local kings (Rajas). Only the first store was company owned and company operated (COCO). Initially it was thought that the COCO store will be viable as there are good margins in the farm input business but the difficulty in obtaining various permissions to build and start a store led to the decision to lease in outlets and, first of all, HPCL was approached followed by Rajas. In Uttar Pradesh, each district has one or two Rajas who owned plenty of land or real estate. The company gave some advance to them for construction of the stores and their layout. These stores were leased to the company for 10 years. The stores have space area of 1100 sq ft of which 350 sq ft was for display and the rest for storage. Most of the HPCL outlets were at the fuel stations in rural interiors which were either not functioning or were not viable. HPCL made this infrastructure of the store for Hydric and leased it out to the company. Some stores were as big as 5000 sq ft area which Hydric calls mini-hubs. The smaller ones are 625 sq ft each.

Since the last few years, Hydric has also worked out a lease arrangement with State *Mandi Parishad* (Agri Market Council) for operating K3 stores. In 2015, it was operating 2 COCO stores, 20 HPCL, 31 Raja and 26 Mandi stores. Most of the Mandi stores started from 2010 onwards, HPCL ones since 2005 going up to 2009 and the Raja ones starting in 2004 and going up to 2010. Overtime, some of the HPCL stores have been closed down and Mandi ones are being increased. In the case of *Mandi Parishad*, there is a fix rent of each store unlike HPCL where there is a percentage of sales and a fixed charge on display area. On the other hand, stores leased from Rajas are at the rate of Rs. 4 per sq ft. Only a few of the Mandi stores are in district headquarters with the rest located in sub-district or bigger village level. The *Mandi Parishad* buildings were constructed for the purpose of *Kisan Seva Kendra* (Farmers Service Centre) and were re-designed for leasing out to hydric. Another major player in farm input business in UP- IFFCO also has 65 Farmer Service Centres (FSS) of which 45 are in *Mandi parishad* leased outlets.

All the stores are run by the company with its own staff which number 400 and including office staff in Lucknow there are 457 staff. Each store is manned by a centre in-charge, one

accountant, an entomologist and a field worker. In bigger hubs, there are 7-8 staff. Though the hubs have a bigger area including the garden but the hubs and centres do not operate in a hub spoke model as it was leading to very high secondary freight. Due to the cost involved in shifting products from hub to spoke, this practice was stopped after one year when it had one hub and 4 centres. The outlets sell various inputs like fertilisers, weedicides, fungicides, micronutrients, bio inputs, agri implements and cattle feed. Though normally it takes 3 years for a store to become viable, in some areas, the company was able to achieve viability at the store level within 6 months.

Overtime, Hydric has moved to preferring *Mandi Parishad* outlets, as there are higher footfalls in these outlets due to the farmer visits to Mandi for selling produce and availability of cash to buy from these stores on cash and carry basis since the company doesn't offer credit as a policy. The company is likely to reach 97 Mandi outlets from the present 26. The company also tried operations in Haryana and Uttara Khand with two and four stores each but had to give up because of the logistical problem of moving materials besides higher cost of operations despite the outlets being leased from HPCL. There was also higher competition in Haryana. The company believes that keeping fixed cost low helps achieve viability sooner. It also believes that franchising cannot be used as there is lack of commitment to sell given products and such players are driven by margins.

The company agrees that if it was not able to lease in store space from various players like HPCL, *Mandi Parishad* and Rajas, it would not have been able to scale up and also be viable. This leasing in has led to lowering of overhead cost. This was one of the innovative strategies used by the company to achieve cost effective operation and scale at the same time. The material is directly supplied to the stores and there is no warehousing involved. There are also plenty of store –to- store exchange of products to manage lower volumes of demand at each store. The company deals in products from more than 3 dozen supplying companies as an institutional buyer/distributor. Like other distributors, it has to do advance booking in some products and gets higher margin as a wholesaler. The company gets 6 days credit period for products supplied by different companies.

Each store caters to 1800-4600 farmers and some going up to 6000 farmers if they are located in district headquarter. The company claims that 75% of its clients are small and marginal farmers and these farmers buy from K3 outlets whenever they can afford to buy on cash. This is so because the quality of products at the stores is better and the prices fair. The farmers are given loyalty cards and their profiles are maintained at each store level. The farmers are also given SMS based voice mail information, about various schemes and extension. Each store caters to farmers in a radius of 15 sq kilometres.

In 2014-15, the company had turnover of Rs. 77 crore (table 4.1). Seeds and chemical pesticides account for 1/3rd of the turnover each, fertilisers and other 25% and the rest coming from cattle feed and agricultural implements. The *Kharif* sales are higher due to large-scale cultivation of paddy in the areas served by the company. Different stores carry different types and packs of different products depending on the cropping pattern in the local area. The turnover of stores varies from Rs. 50 lakhs to Rs. 2.5 crore each.

Table 4.1: Annual turnover of Hydric (2004-05 to 2013-14).

Year	Turnover in Rs. crore
2004-05	0.32
2005-06	2.04
2006-07	6.73
2007-08	21.18
2008-09	27.01
2009-10	33.26
2010-11	35.98
2011-12	40.42
2012-13	56.37
2013-14	77.00

Source: Company records

It claims that it has 5% share in sales of farm inputs in each locality where its stores are located. It does not feel that cash sales are a barrier as farmers value good quality and reasonable prices. It also attempted operations as a business correspondent of ICICI bank but could not continue operations due to its location in Lucknow which was far away from the farmers being served and was not permitted by RBI rules. It also attempted life insurance jointly with a few insurance companies but discontinued this as it was not

compatible with its core business. It has its own brand of pesticides and is also coming up with an arrangement with ITC wherein it will manage the agri-input part of the 8 Choupal Sagar outlets in Uttar Pradesh. The ITC will make separate premises and it will be geared to meet farmer's needs. The company offers different prices for the same products across different outlets in order to remain price competitive in each market.

It claims that 70-80% farmers have benefitted from its operations in local areas. It has also worked with the State government by selling subsidised seed of wheat and paddy from its outlets. Another innovative thing the company carried out is training specialised spray franchisees who are given spray machines on rental of Rs. 10 per day. This is also used to promote liquid fertiliser application in order to overcome shortage of fertilisers. It has 2-4 spray franchisees in each centre who charge for the services from the farmers. They are trained in the use of machines and inputs by the company. It also undertakes soil testing for the farmers for Rs. 50 per sample. It has continued to retain farmer loyalty with only some big farmers moving away in the initial years. All the farmer services like voice based SMS and other extension materials are produced in house and farmer help line is available to all farmers. It also organises farmer's g*oshtis* (discussions) at the stores as well as in the villages wherein extension specialists from KVKs and agri-input companies interact with farmers. Some of these *goshtis* are sponsored and the others are financed by the company. The field staff interacts with 30-50 farmers across one/two villages per day and collects all the information relating to their profile. Night *ghoshtis* are much more useful where there are technical sessions. Mega *ghoshtis* are held at the stores where farmers across districts participate. It has also participated in developmental projects like *Sunehra* India of Bill and Melinda Gates Foundation and Janhit Foundation for providing quality inputs and technical expertise to farmer groups. The company has also acquired a license to procure farm produce i.e. oilseeds, pulses and maize. Since the company supplies inputs to farmers, it knows which farmer has grown which type of variety and what kind of inputs.

4.2 **Methodology**

Hydric has 79 centres (K3s) across UP in mid-2015 (table 1 in appendix 4.1). The year of setting up of each centre, type of centre (whether owned, leased from HPCL, Rajas or

Mandi Parishad) and the district profiles were considered to choose a sample of seven such stores for farmer interviews- both of K3 buyers- exclusive and others and non-K3 buyers to compare and contrast the farmer level impact of K3 centres (table 4.2) Our sample consisted of three types of farmers in UP- exclusive K3 buyers, K3 buyers who also bought from other sources, and non-K3 buyers who bought from traditional sources. This was to exactly understand the preferences and engagement of the different types of buying and non-buying farmers. Further, the farmers belonged to different categories of marginal, small, semi-medium, medium and large in both buying and non-buying strata. This was meant to assess the inclusiveness of the new channel (K3). Though exclusive buyers were a small percentage of the total (18%), they were substantial i.e. 33% of the K3 buyers. The %age of exclusive buyers was higher in Lakhimpur than that in Barabanki. It would be interesting to understand their profile and reasons for being exclusive K3 buyers for all inputs (table 4.3).

Table 4.2: District wise and store type wise details of sample farmers

District	Center	Type	Year of opening	Buyers	Non-buyers
Barabanki	Safdarganj	Mandi	2013	10	6
Barabanki	Satrikh	HPCL	2006	10	6
Barabanki	Ramnagar	Raja	2006	10	6
Lakhimpur	**Karanpur**	**Owned**	**2004**	**10**	**6**
Lakhimpur	Kasta	HPCL	2008	10	6
Lakhimpur	Mohammdi	Mandi	2012	10	6
Lakhimpur	Aliganj	Raja	2007	10	6
All	**7**			**70**	**42**

Table 4.3: Category wise distribution of sample farmers in UP

District and farmer type	No.of farmers	% of total
Lakhimpur	64 (100)	57.14
K3 exclusive Buyer in Lakhimpur (% in Lakhimpur)	14(21.87)	12.5
K3 Buyer(“)	26 (40.63)	23.21
All K3 Buyer	40 (62.5)	35.71
Non K3 Buyer	24 (37.5)	21.43
B**arabanki**	48 (100)	42.86
K3 exclusive Buyer (%in Barabanki)	7(14.58)	6.25
K3 Buyer (“)	23(47.92)	20.54
All K3 Buyer	30 (62.5)	26.79
Non K3 Buyer	18(37.5)	16.07
Total of both districts	112	100
K3 Buyer (“)	21	18.75
K3 buyer	49	43.75
All K3 Buyer	70	62.5
Non K3 Buyer	42	37.5

Note: figures in parentheses are % within each district.
Source: primary data

4.3 Major findings

The tables 4.4 and 4.5 show that though UP is dominated by small and marginal farmers in general, Barabanki farmers were much smaller in average land size and were predominantly marginal and small in terms of their proportion in total. The average size of land in Lakhimpur was almost double that of in Barabanki both in owned and operated land terms. There was higher leasing in net terms in Lakhimpur making the operational land holding larger by almost one acre on an average than the owned land holding. The K3 buyers were smaller farmers in general than their non-buying counterparts especially those who exclusively bought from K3. But, on an average, K3 buyers (exclusive) leased in much higher land on an average both in Lakhimpur and Barabanki than their non-K3 counterparts. The average operated land size of K3 non-exclusive buyers in Lakhimpur was as high as 11 acres while those who bought exclusively, it was only 6 acres. The smallest average land holding was that of non-K3 buyers in Barabanki i.e. just 2.87 acres (table 4.5).

This is in contrast to what Reardon et al (2011) found based on a study of 6 large hub retail outlets of HKB with two each across central, eastern and western UP which in 2010 had 300 outlets across states with 97 in UP of which 30 were hubs and 67 small stores with limited product range. In total, 810 farm households across 30 villages were surveyed out of which 420 were rural supermarket chain store users and 390 were non-supermarket chain (rural supermarket) users. These HKB farmers had an average land holding of 1.7 hectares which was higher than the actual average of study areas (0.64 hacs) and that of the state (0.8 hacs). This was so as HKB outlets were located more in areas with larger holdings like western UP.

Canal irrigation was negligible and only in Barabanki district, a few marginal farmers depended on it. In Lakhimpur, only 10-25% farmers across categories also used canal irrigation along with tubewell compared with 40-100% farmers using canal water alongside tubewells (table 4.6). Except a few large farmers in Lakhimpur who were completely dependent on tubewell based irrigation, 2/3 farmers used tubewell irrigation and 1/3 canal and tubewell both. In general, exclusive buyers were less likely to own tractors compared with their K3 buyers counterparts and non-K3 buyers in both the districts but Barabanki in

Table 4.4: District-wise and farmer category-wise Distribution of farmers by Own landholding

Farmer category> Type of farmer and %age in total	Marginal Farmers	Small Farmers	Semi Medium Farmers	Medium farmers	Large farmers	Total
Total No. of farmers	46	29	25	10	2	112
%age	41.07	25.89	22.32	8.92	1.79	100
Average	1.48	3.92	8.11	17.5	50	5.97
No. of farmers- Lakhimpur	22	15	17	8	2	64
%age	34.38	23.43	26.56	12.50	3.13	100
Average	1.48	3.7	9.19	18.12	50	7.44
No. of farmers- Barabanki	24	14	8	2	0	48
%age	50	29.16	16.66	4.16	0	100
Average	1.49	4.16	7.41	15	0	3.82
No. of Exclusive K3 buyers	7	7	6	1	0	21
%age	33.33	33.33	28.57	4.77	0	100
Average	1.78	3.86	7.67	17	0	6.06
No. of K3 buyers	14	14	13	7	1	49
%age	28.57	28.57	26.53	14.29	2.04	100
Average	1.52	3.93	7.67	18.57	50	7.26
No. of All K3 buyers	21	21	19	8	1	70
%age	30	30	27.14	11.43	1.43	100
Average	1.61	3.9	7.67	18.38	50	6.68
No. of non-K3 buyers	25	8	6	2	1	42
%age	59.52	19.05	14.29	4.76	2.38	100
Average	1.38	3.97	9.5	14	50	4.79
No. of Exclusive K3 Buyers- Lakhimpur	5	4	4	1	0	14
%age	35.72	28.57	28.57	7.14	0	100
Average	1.8	3.75	8	17	0	5.21
No. of Exclusive K3 Buyers- Barabanki	2	3	2	0	0	7
%age	28.57	42.86	28.57	0	0	100
Average	1.75	4	7	0	0	4.21
No. of K3 Buyers- Lakhimpur	5	7	8	5	1	26
%age	19.23	26.92	30.77	19.23	3.85	100
Average	1.5	3.64	7.69	20	50	9.4
No. of K3 Buyers- Barabanki	9	7	5	2	0	23
%age	39.13	30.43	21.74	8.70	0	100
Average	1.53	4.21	7.65	15	0	4.85
No. of All K3 Buyers- Lakhimpur	10	11	12	6	1	40
%age	25	27.50	30	15	2.50	100
Average	1.65	3.68	7.79	19.5	50	7.94
No. of All K3 Buyers- Barabanki	11	10	7	2	0	30
%age	36.67	33.33	23.33	6.67	0	100
Average	1.57	4.15	4.46	15	0	4.7
No. of non-K3 Buyers- Lakhimpur	12	4	5	2	1	24
%age	50	16.67	20.83	8.33	4.17	100
Average	1.33	3.75	10	14	50	6.63
No. of non-K3 Buyers- Barabanki	13	4	1	0	0	18
%age	72.22	22.22	5.56	0	0	100
Average	1.42	4.19	7		0	2.35

Source: primary data

Table 4.5: District-wise and farmer category-wise Distribution of farmers by Operated landholding

District wise Operated landholding	MF	SF	SMF	MF	LF	Total
Total No. of farmers	38	34	24	12	4	112
%age	33.93	30.36	21.43	10.71	3.57	100
Average	1.6	4.08	8.04	15.52	41.25	6.64
Total No. of farmers Lakhimpur	19	16	16	9	4	64
%age	28.13	25	25	14.06	6.25	100
Average	3.97	3.97	8.13	16.44	41.25	8.39
Total No. of farmers Barabanki	19	18	8	3	0	48
%age	39.58	37.50	16.67	6.25	0	100
Average	1.6	4.18	7.87	12.75	0	4.31
Total farmers (Exclusive K3 buyers)	5	8	7	1	0	21
%age	23.81	38.10	33.33	4.76	0	100
Average	1.8	4	7.29	25	0	5.75
Total No. of farmers (K3 buyers)	10	16	11	9	3	49
%age	20.41	32.65	22.45	16.33	6.12	100
Average	1.5	4.12	8.14	14.58	38.33	8.5
Total No. of All K3 buyers	15	24	18	10	3	70
%age	21.43	34.29	25.71	14.29	4.29	100
Average	1.6	0.08	7.8	15.62	38.33	7.62
Total No. of non-K3 buyers	23	10	6	2	1	42
%age	54.76	23.81	14.29	4.76	2.38	100
Average	1.61	4.07	8.75	15	50	5.01
No. ExcluciveK3 Buyers-Lakhimpur	3	5	5	1	0	14
%age	21.43	35.71	35.71	7.14	0	100
Average	1.83	3.8	7.2	25	0	6.11
No. Exclusive K3 Buyers-Barabanki	4	6	7	6	3	26
%age	15.38	23.08	26.92	23.08	11.54	100
Average	1.62	4.08	7.71	15.5	38.33	11.27
No. of K3 Buyers-Lakhimpur	7	11	12	7	3	40
%age	17.50	27.50	30	17.50	7.50	100
Average	1.71	3.95	7.5	16.86	38.33	9.46
No. of K3 Buyers-Barabanki	2	3	2	0	0	7
%age	28.57	42.86	28.57	0	0	100
Average	1.75	4.33	7.5	0	0	4.5
No. of all K3 Buyers-Lakhimpur	6	10	4	3	0	23
%age	26.09	43.48	17.39	13.04	0	100
Average	1.42	4.15	8.87	12.75	0	5.38
No. of all K3 Buyers-Barabanki	8	13	6	3	0	30
%age	26.67	43.33	20	10	0	100
Average	1.5	4.19	8.42	12.75	0	5.17
No. of non-K3 Buyers-Lakhimpur	12	5	4	2	1	24
%age	50	20.83	16.67	8.33	4.17	100
Average	1.54	4	10	15	50	6.6
No. of non-K3 Buyers-Barabanki	11	5	2	0	0	18
%age	61.11	27.78	11.11	0	0	100
Average	1.68	4.15	6.25	0	0	2.87

Table 4.6: Source wise and District wise Irrigation profile of farmers

Source of irrigation> Category of farmer	Own land Irri. Tubewell (Operated land irri. Tubewell)	Own Land Irri. Canal (Operated land irri. Canal)	Own land Irri. both sources (Operated land irri. Both sources)	Total
Lakhimpur	57 (56)	0 (0)	7 (8)	64
%age of total	89.06 (87.50)	0 (0)	10.94 (12.50)	100
Marginal Farmers	17 (17)	0 (0)	2 (2)	19
%age in category	89.47 (89.47)	0 (0)	10.53 (10.53)	100
Small Farmers	13 (12)	0 (0)	3 (4)	16
%age in category	81.25 (75)	0 (0)	18.75 (25)	100
Semi Medium Farmers	15 (15)	0 (0)	1 (1)	16
%age in category	93.75 (93.75)	0 (0)	6.25 (6.25)	100
Medium farmers	8 (8)	0 (0)	1 (1)	9
%age in category	88.89 (88.89)	0 (0)	11.11 (11.11)	100
Large farmers	4 (4)	0 (0)	0 (0)	4
%age in category	100 (100)	0 (0)	0 (0)	100
Barabanki	20 (20)	4 (3)	24 (25)	48
%age in total	41.67 (41.67)	8.33 (6.25)	50 (52.08)	100
Marginal Farmers	9 (9)	3 (2)	7 (8)	19
% age in category	47.37 (47.37)	15.79 (10.53)	36.84 (42.11)	100
Small Farmers	9 (9)	0 (0)	9 (9)	18
%age in category	50 (50)	0 (0)	50 (50)	100
Semi Medium Farmers	2 (2)	1 (1)	5 (5)	8
%age in category	25 (25)	12.50 (12.50)	62.50 (62.50)	100
Medium farmers	0 (0)	0 (0)	3 (3)	3
% age in category	0 (0)	0 (0)	100 (100)	100
Total in two districts	77 (76)	4 (3)	31 (33)	112
%age in total	68.75 (67.86)	3.57 (2.68)	27.68 (29.46)	100
Marginal Farmers	26 (26)	3 (2)	9 (10)	38
%age in category	68.42 (68.42)	7.79 (5.26)	23.68 (26.32)	100
Small Farmers	22 (21)	0 (0)	12 (13)	34
%age in category	64.71 (61.76)	0 (0)	35.29 (38.24)	100
Semi Medium Farmers	17 (16)	1 (1)	6 (6)	24
%age in category	70.83 (66.67)	4.17 (4.17)	25 (25)	100
Medium farmers	8 (8)	0 (0)	4 (4)	12
%age in category	66.67 (66.67)	0 (0)	33.33 (33.33)	100
Large farmers	4 (4)	0 (0)	0 (0)	4
%age in category	100 (100)	0 (0)	0 (0)	100

Note: figures in parentheses are for operated area.
Source: primary data.

general had lower ownership of tractors across all categories compared with those in Lakhimpur . This was also due to the fact that land holdings in Barabanki were much smaller than those in Lakhimpur. Of all, only 50% of farmers owned a tractor (table 4.7). Further, more of small and marginal farmers had tractors in Barabanki than in Lakhimpur. Across the two districts, all medium and large farmers had a tractor and very few (10-15%)

of small had a tractor with more of them having tractors in Barabanki than in Lakhimpur (table 4.8).

Table 4.7 : Pattern of tractor ownership across districts and farmer types

District and category-	No. and % of farmers who owned Tractor
All farmers	57
%age share	50.89
K3 Exclusive	7
%age share	33.33
K3 buyers	32
%age share	65.31
All K3	39
%age share	55.71
All non-K3 buyers	18
%age share	42.86
Lakhimpur	36
%age share	56.25
K3 Exclusive Buyers-Lakhimpur	6
%age share	42.86
K3 Buyers Lakhimpur	19
%age share	73.08
All K3 Buyers Lakhimpur	25
%age share	62.50
non-K3 Buyers Lakhimpur	11
%age share	45.83
Barabanki	21
%age share	43.75
K3 Exclusive Buyers Barabanki	1
%age share	14.29
K3 Buyers Barabanki	13
%age share	56.52
All K3 Buyers Barabanki	14
%age share	46.67
non-K3 Buyers Barabanki	7
%age share	38.89

Source: primary data

Table 4.8: Farmer Category wise and District wise Ownership of tractors

District> Farmer categories	Lakhimpur	Barabanki	Total
Marginal Farmers	2	3	5
%age in distt total	5.56	14.29	8.77
% out of category total	10.53	15.79	13.16
Small Farmers	6	9	15
%age in distt total	16.67	42.86	26.32
% out of category total	37.5	50	44.12
Semi Medium Farmers	15	6	21
%age in distt total	41.67	28.57	36.84
% out of category total	93.75	75	87.5
Medium farmers	9	3	12
%age in distt total	25	14.29	21.05
% out of category total	100	100	100
Large farmers	4	0	4
% age in distt total	11.11	0	7.02
% out of category total	100	0	100
Total	36	21	57
% age	100	100	100
% out of category total	56.25	43.75	50.89
% age out of 57	63.16	36.84	100

Source: primary data

It was found that 2/3 of farmers were in the age groups of 21-30, 31-40 and 41-50 years in both districts both in case of those buying from K3 as well as non-k3 buyers. There were 15-20% farmers mostly in semi medium and medium categories who were above 60 years of age. In Lakhimpur, marginal and large farmer average age was lower than their other counterparts among K3 buyers and semi-medium and medium categories had farmers in higher age groups. On the other hand, In Barabanki, it was no difference in average age for any category except that there were no farmers in large category as landholdings were generally smaller. Overall, it was medium category farmers which were aged with average age being 51 years (tables 4.9 and 4.10). On the other hand, among non-K3 buyers, it was marginal and small farmers who were older in age on average, especially those in Barabanki than their other counterparts.

Table 4.9: Distribution of K3 buyers by district and age groups

Age groups> District and farmer category	21-30	31-40	41-50	51-60	61-70	71 &>	Total
Lakhimpur	6	13	8	7	5	1	40
Average	28	37	46.63	55.29	65.2	84	45.28
%age	15	32.5	20	17.5	12.5	2.5	100
Marginal Farmers	1	3	3	0	0	0	7
Average	25	38.33	45	0	0	0	39.29
%age	14.29	42.86	42.86	0	0	0	100
Small Farmers	2	2	3	4	0	0	11
Average	27.50	36	44	55.75	0	0	43.82
%age	18.18	18.18	27.27	36.36	0	0	100
Semi Medium Farmers	3	3	1	2	2	1	12
Average	29.33	35.33	50	54.5	63.5	84	47
%age	25	25	8.33	16.67	16.67	8.33	100
Medium farmers	0	3	0	1	3	0	7
Average	0	38.67	0	55	66.33	0	52.86
%age	0	42.86	0	14.29	42.86	0	100
Large farmers	0	2	1	0	0	0	3
Average	0	36	48	0	0	0	40
%age	0	66.67	33.33	0	0	0	100
Barabanki	5	5	10	6	4	0	30
Average	26.8	38.2	45.6	56.33	66	0	46.1
%age	16.67	16.67	33.33	20	13.33	0	100
Marginal Farmers	2	1	2	1	2	0	8
Average	30	35	45.5	60	67.5	0	47.63
%age	25	12.5	25	12.5	25	0	100
Small Farmers	2	2	4	4	1	0	13
Average	24.5	39	45.5	55.75	62	0	45.69
%age	15.38	15.38	30.77	30.77	7.69	0	100
Semi Medium Farmers	1	2	1	1	1	0	6
Average	25	39	42	55	67	0	44.5
%age	16.67	33.33	16.67	16.67	16.67	0	100
Medium farmers	0	0	3	0	0	0	3
Average	0	0	47	0	0	0	47
%age	0	0	100	0	0	0	100
Total	11	18	18	13	9	1	70
Average	27.45	37.33	45.61	55.77	65.56	84	45.63
%age	15.71	25.71	25.71	18.57	12.86	1.43	100
Marginal Farmers	3	4	5	1	2	0	15
Average	28.33	37.5	45.2	60	67.5	0	43.73
%age	20	26.67	33.33	6.67	13.33	0	100
Small Farmers	4	4	7	8	1	0	24
Average	26	37.5	44.86	55.75	62	0	44.83
%age	16.67	16.67	29.17	33.33	4.17	0	100
Semi Medium Farmers	4	5	2	3	3	1	18
Average	28.25	36.8	46	54.67	64.67	84	46.17
%age	22.22	27.78	11.11	16.67	16.67	5.56	100
Medium farmers	0	3	3	1	3	0	10
Average	0	38.68	47	55	66.33	0	51.1
%age	0	30	30	10	30	0	100
Large farmers	0	2	1	0	0	0	3
Average	0	36	48	0	0	0	40
%age	0	6.67	33.33	0	0	0	100

Source: primary data

Table 4.10: Distribution of Non-K 3 buyers by district and age groups

Age group> District and farmer category	21-30	31-40	41-50	51-60	61-70	Total
Lakhimpur	4	6	7	6	1	24
Average	27.75	34.83	46.14	57.67	70	43.79
%age	16.67	25	29.17	25	4.17	100
Marginal Farmers	1	3	6	2	0	12
Average	28	36.67	45.5	58.5	0	44
%age	8.33	25	50	16.67	0	100
Small Farmers	1	1	1	1	1	5
Average	25	31	50	55	70	46.2
%age	20	20	20	20	20	100
Semi Medium Farmers	2	0	0	2	0	4
Average	25	0	0	59.5	0	42.25
%age	50	0	0	50	0	100
Medium farmers	0	2	0	0	0	2
Average	0	34	0	0	0	34
%age	0	100	0	0	0	100
Large farmers	0	0	0	1	0	1
Average	0	0	0	55	0	55
%age	0	0	0	100	0	100
Barabanki	3	4	6	2	3	18
Average	23.33	38.75	46.67	54	66.33	45.11
%age	16.67	22.22	33.33	11.11	16.67	100
Marginal Farmers	0	4	3	2	2	11
Average	0	38.75	45.67	54	64.5	48.09
%age	0	36.36	27.27	18.18	18.18	100
Small Farmers	1	0	3	0	1	5
Average	22	0	47.67	0	70	47
%age	20	0	60	0	20	100
Semi Medium Farmers	2	0	0	0	0	2
Average	24	0	0	0	0	24
%age	100	0	0	0	0	100
Total	7	10	13	8	4	42
Average	24.71	36.4	46.38	56.75	67.25	44.36
%age	16.67	23.81	30.95	19.05	9.52	100
Marginal Farmers	1	7	9	4	2	23
Average	28	37.86	45.55	56.25	64.5	45.96
%age	4.35	30.43	39.13	17.39	8.7	100
Small Farmers	2	1	4	1	2	10
Average	23.5	31	48.25	55	70	46.6
%age	20	10	40	10	20	100
Semi Medium Farmers	4	0	0	2	0	6
Average	24.5	0	0	59.5	0	36.17
%age	66.67	0	0	33.33	0	100
Medium farmers	0	2	0	0	0	2
Average	0	34	0	0	0	34
%age	0	100	0	0	0	100
Large farmers	0	0	0	1	0	1
Average	0	0	0	55	0	55
%age	0	0	0	100	0	100

Source: primary data

Table 4.11: District wise and category wise distribution of K3 and non-K3 farmers by age groups

Age group> District and type of farmer	21-30	31-40	41-50	51-60	61-70	71 &>
All	**18**	**28**	**31**	**21**	**13**	**1**
%age	**16.07**	**25**	**27.68**	**18.75**	**11.61**	**0.89**
Lakhimpur	10	19	15	13	6	1
%age	8.93	16.96	13.39	10.61	5.36	0.89
Barabanki	8	9	16	8	7	0
%age	7.14	8.04	18.29	7.14	6.25	0
LakhimpuK3 exclusive Buyer	3	4	3	2	1	1
%age	2.68	3.57	2.68	1.79	0.89	0.89
LakhimpuK3 Buyer	3	9	5	5	4	0
%age	2.68	8.04	4.46	4.46	3.57	0
LakhimpuK3 (jointly)Buyer	6	13	8	7	5	1
%age	5.36	10.61	7.14	6.25	4.46	0.89
Lakhimpur non K3 buyer	4	6	7	6	1	0
%age	3.57	5.36	6.25	5.36	0.89	0
Barabanki K3 exclusive Buyer	2	1	1	3	0	0
%age	1.79	0.89	0.89	2.68	0	0
Barabanki K3 Buyer	3	4	9	3	4	0
%age	2.68	3.57	8.04	2.68	3.57	0
Barabanki K3 (jointly)Buyer	5	5	10	6	4	0
%age	4.46	4.46	8.93	5.36	3.57	0
Barabanki non K3 buyer	3	4	6	2	3	0
%age	2.68	3.57	5.36	1.79	2.68	0

Source: primary data

Table 4.12: Distribution of farmers by category and Religion

Religion> District wise category	Hindu	Sikh	Muslim	Total
Lakhimpur	55	7	2	64
%age	85.94	10.94	3.13	100
K3 exclusive Buyer	14	0	0	14
%age	21.88	0	0	21.88
K3 Buyer	20	4	2	26
%age	31.25	6.25	3.13	40.63
All K3 Buyer	34	4	2	40
%age	53.13	6.25	3.13	62.50
Non K3 Buyer	21	3	0	24
%age	32.81	4.69	0	37.50
Barabanki	48	0	0	48
%age	100	0	0	100
K3 exclusive Buyer	7	0	0	7
%age	14.58	0	0	14.58

K3 Buyer	23	0	0	23
%age	47.92	0	0	47.92
All K3 Buyer	30	0	0	30
%age	62.50	0	0	62.50
Non K3 Buyer	18	0	0	18
%age	37.50	0	0	37.50
Total of both districts	103	7	2	112
%age	91.96	6.25	1.79	100
K3 exclusive Buyers	21	0	0	21
%age	18.75	0	0	18.75
K3 Buyers	43	4	2	49
%age	38.39	3.57	1.79	43.75
All K3 Buyer	64	4	2	70
%age	57.14	3.57	1.79	62.50
All Non K3 Buyer	39	3	0	42
%age	34.82	2.68	0	37.50

Source: primary data

A vast majority of K3 farmers (91%) were Hindu, followed by Sikhs and Muslims in Lakhimpur whereas all farmers in Barabanki were Hindus only. The non-Hindu farmers were mostly in small medium and large categories unlike their Hindu counterparts. On the other hand, non k3 farmers were composed only of Hindu and Sikh farmers across the two districts and all K3 excusive buyers all happened to be Hindus (table 4.12). For more details of caste and religious profile of the farmers, see appendix 4.1 tables 2, 3 and 4.

In literacy, Barabanki had higher proportion of graduates but in general higher illiteracy than in Lakhimpur. The farmers in general were primary, secondary or higher secondary literate. Marginal and small ones were less literate than their counterparts across the two districts (table 4.13). The Barabanki farmers had higher levels including in K3 exclusive category and in general there were relatively few graduate and post-graduate farmers and they (graduates and PGs) were mostly in non-buyer or non-exclude buyers category so far as K3 was concerned (table 4.14).

Table 4.13: District-wise Distribution of farmers by category and literacy level

Education Level> District and farmer category	Illiterate	Primary	Secondary	Senior Secondary	Higher Secondary	Graduate	Post Graduate	Total
Lakhimpur	8	13	12	14	9	4	4	64
%age	12.50	20.31	18.75	21.88	14.06	6.25	6.25	100
Marginal Farmers	4	4	5	4	0	1	1	19
%age	6.25	6.25	7.81	6.25	0	1.56	1.56	29.69
Small Farmers	1	3	2	4	4	1	1	16
%age	1.56	4.69	3.13	6.25	6.25	1.56	1.56	25
Semi MedFarmers	2	4	3	4	1	1	1	16
%age	3.13	6.25	4.69	6.25	1.56	1.56	1.56	25
Medium farmers	1	2	1	1	2	1	1	9
%age	1.56	3.13	1.56	1.56	3.13	1.56	1.56	14.06
Large farmers	0	0	1	1	2	0	0	4
%age	0	0	1.56	1.56	3.13	0	0	6.25
Barabanki	9	8	6	5	12	8	0	48
%age	18.75	16.67	12.50	10.42	25	16.67	0	100
Marginal Farmers	7	4	3	2	3	0	0	19
%age	14.58	8.33	6.25	4.17	6.25	0	0	39.58
Small Farmers	2	2	1	2	6	5	0	18
%age	4.17	4.17	2.08	4.17	12.50	10.42	0	37.50
Semi MedFarmers	0	1	2	0	2	3	0	8
%age	0	2.08	4.17	0	4.17	6.25	0	16.67
Medium farmers	0	1	0	1	1	0	0	3
%age	0	2.08	0	2.08	2.08	0	0	6.25
Total	17	21	18	19	21	12	4	112
%age	15.18	18.75	16.07	16.96	18.75	10.71	3.57	100
Marginal Farmers	11	8	8	6	3	1	1	38
%age	9.82	7.14	7.14	5.36	2.68	0.89	0.89	33.93
Small Farmers	3	5	3	6	10	6	1	34
%age	2.68	4.46	2.68	5.36	8.93	5.36	0.89	30.36
Semi Med Farmers	2	5	5	4	3	4	1	24
%age	1.79	4.46	4.46	3.57	2.68	3.57	0.89	21.43
Medium farmers	1	3	1	2	3	1	1	12
%age	0.89	2.68	0.89	1.79	2.68	0.89	0.89	10.71
Large farmers	0	0	1	1	2	0	0	4
%age	0	0	0.89	0.89	1.79	0	0	3.57

Source: primary data

Table 4.14: Category and district wise Distribution of farmers by Literacy level

Literacy Level> District and category	Illiterate	Primary	Secondary	Senior Secondary	Higher Secondary	Graduate	Post Graduate	Total
Lakhimpur	8	13	12	14	9	4	4	64
%age	12.5	20.31	18.75	21.88	14.06	6.25	6.25	100
K3 exclusive Buyer	2	3	1	4	3	1	0	14
%age	14.29	21.43	7.14	28.57	21.43	7.14	0	100
K3 Buyer	2	5	5	6	4	2	2	26
%age	7.69	19.23	19.23	23.08	15.39	7.69	7.69	100
K3 (jointly)Buyer	4	8	6	10	7	3	2	40
%age	10	20	15	25	17.5	7.5	5	100
Non K3 Buyer	4	5	6	4	2	1	2	24
%age	16.67	20.83	25	16.67	8.33	4.17	8.33	100
Barabanki	9	8	6	5	12	8	0	48
%age	18.75	16.67	12.5	10.41	25	16.67	0	100
K3 exclusive Buyer	1	2	1	1	2	0	0	7
%age	14.28	28.58	14.28	14.28	28.58	0	0	100
K3 Buyer	2	4	0	4	6	7	0	23
%age	8.7	17.39	0	17.39	26.09	30.43	0	100
K3 (jointly)Buyer	3	6	1	5	8	7	0	30
%age	10	20	3.33	16.67	26.67	23.33	0	100
Non K3 Buyer	6	2	5	0	4	1	0	18
%age	33.33	11.11	27.78	0	22.22	5.56	0	100
Total	17	21	18	19	21	12	4	112
%age	15.18	18.75	16.07	16.96	18.75	10.71	3.57	100

So far as cropping pattern of farmers is concerned, there were clear differences across districts and sets of farmers. Sugarcane was mainly in Lakhimpur and accounted for 23% of GCA with K3 exclusive byers putting as much as 50% area under it and other K3 farmers only 19% thus altogether 25% of K3 buyer farmer area being under sugarcane. Compared with this, non-K3 buyers had only 20% area under the crop. Further, in Barabanki, it was a small time crop with only 1% area under it and that too mainly in case of non-K3 buyers who had 4% area under it. The K3 categories did not go for it at all. Overall, 15% of all surveyed farmer GCA was under sugarcane and average was 3.84 acres with those in Lakhimpur having 3.96 acres on an average. In Kharif, major crop was paddy across both districts with share of 33% and 36% of GCA in Lakhimpur and Barabanki and 34% of area across districts followed by wheat in *rabi* which was equally important with 33% and 24% of GCA in Lakhimpur and Barabanki , the overall share of wheat in GCA being 30%. The next major crop was paddy in *zaid* season only in Lakhimpur with 7% of GCA grown only by a few large

farmers in one set of villages. The other crops were menthe and mustard in that order with 7% and 4% of GCA across the two districts with mentha being grown only in Barabanki with 21% of GCA in the district and mustard in 11% of GCA in the district. The other high value crops in Barabanki were pulses in Kharif (2% of GCA) *masoor* (1.8% of GCA) and potato (1% of GCA) in *rabi* and vegetables (1% of GCA) (table 4.17). Further, it was exclusive buyers of K3 who grew relatively less paddy, maize and wheat and more of pulses, mustard, menthe, potato and vegetables across both the districts as %age of GCA, which are all high value crops. They were also more into sugarcane compared with their other counterparts in Lakhimpur.

On the other hand, farmer category wise, cropping pattern revealed that sugarcane was a big crop for medium and semi-medium farmers who put as much as 20% of their GCA to this crop whereas marginal and small categories had only about 15% of their GCA. The sugarcane area was much larger among small, semi-medium, and medium categories with % of GCA being 32-41%. In Barabanki, very few marginal and small farmers only grew sugarcane and it was only 1-4% of their GCA but medium farmers in the district had as good a proportion as those in the other district. Paddy was an important crop for all categories of farmers with 30-35% of the GCA across categories. Maize was grown only in Barabanki by some marginal and small farmers on a small area varying between 0.6-2.5% of GCA. Sam was the case with pulses in Kharif with only Barabanki farmers in marginal, small and medium categories growing on a small percentage of GCA (2-4 %). In Rabi, wheat was a large crop in terms of %age of GCA occupied ranging from 25-35% in Lakhimpur and 20-25% of GCA in case of Barabanki. In Lakhimpur, not many farmer grew high value crops like green peas, *masur*, mustard or potato or mentha or vegetables whereas in Barabanki, mustard was 11% of GCA and grown by mostly small and semi medium farmers on 13-17% of their GCA and potato on 1-2% of GCA by these categories of farmers. semi-medium farmers also grew *masoo*r on 2.5% of their GCA. Menthe was a significant crop in the district grown by all categories of farmers on almost 20% of their GCA. *Zaid* paddy was grown only by large farmers on 10% of their GCA. Vegetables found space only on medium and small farmers upto 1-2% of their GCA. Marginal farmers had less than

10% of GCA and small another 18% with rest equally divided among other three categories but in Lakhimpur, the marginal category share was only 5% and small 8% compared with Barabanki where marginal had 14% of GCA and small had 35% of it with rest 30% with semi-medium and 20% with medium there being no large farmers. In Lakhimpur, large category had 40% and medium 20% share in GCA (table 4.17).

In general, Barabanki had higher cropping intensity than Lakhimpur and further marginal farmers in Lakhimpur had higher cropping intensity than other categories except large ones and in Barabanki it was not very different across cateogories.K3 exclusive buyers were less intensive than others and in Barabanki they were the most intensive cultivators of their land. Sugarcane was grown more by non-K3 buyers and mostly in Lakhimpur and there was no difference in acreage of sugarcane across categories (table 4.15 and 4.16).

Table 4.15: District and Farmer category wise cropping intensity (CI)

District and category	Gross Area Sown	Net operated area	CI
Lakhimpur	963.00	537	1.79
Marginal Farmers	46.00	30.5	1.51
Small Farmers	88.50	63.5	1.38
Semi Medium Farmers	184.00	130	1.42
Medium farmers	224.50	148	1.52
Large farmers	420.00	165	2.55
Barabanki	521.25	207	2.52
Marginal Farmers	74.25	30.5	2.43
Small Farmers	184.00	75.25	2.45
Semi Medium Farmers	161.00	63	2.56
Medium farmers	102.00	38.25	2.67
Total	1484.25	744	1.99
Marginal Farmers	120.25	61	1.97
Small Farmers	277.50	138.75	1.96
Semi Medium Farmers	345.00	193	1.79
Medium farmers	326.50	186.25	1.75
Large farmers	420.00	165	2.55

Source: based on primary data

Table 4.16: Farmer category and district wise cropping intensity (CI)

District and category	GSA	Net operated area	CI
Lakhimpur	963	537	1.79
K3 Exclusive Buyers	114	85.5	1.33
K3 Buyers	542.75	293	1.85
All K3 Buyers	656.75	378.5	1.73
non-K3 Buyers	306.25	158.5	1.93
Barabanki	521.25	207	2.52
K3 Exclusive Buyers	88.25	31.5	2.80
K3 Buyers	314.5	123.75	2.54
All K3 Buyers	402.75	155.25	2.59
non-K3 Buyers	118.5	51.75	2.29
All	1484.25	744	1.99
K3 Exclusive Buyers	202.25	117	1.73
K3 Buyers	857.25	416.75	2.05
All K3 Buyers	1059.5	533.75	1.98
non-K3 buyers	424.75	210.25	2.02

Source: based on primary data

Table 4.17: Farmer buyer category wise and district wise cropping pattern of farmers

Seasons> District and Parameter (% of GCA, and average area in acres)	**Annual**	**Kharif**			**Rabi**					***Zaid***			
Crops>	Sugarcane	Paddy	Maize	Pulses	Wheat	Green Pea	*Masoor*	Mustard	Potato	Mentha	Paddy2	Vegetables	Gross Area
All farmers	227.25	501	5	10.75	439.75	3.5	9	57.75	6.75	107.5	110	5	1483.25
%age share	15.32	33.78	0.34	0.72	29.65	0.24	0.61	3.89	0.46	7.25	7.42	0.34	
Average area	3.85	4.47	0.83	1.34	3.92	0.87	1.28	1.48	0.96	2.44	36.66	1.66	
K3 Exclusive Buyers	57	56.5	0	3.5	47.75	0	1	9.25	2	23.25	0	2	202.25
%age share	28.18	27.94	0	1.73	23.61	0	0.49	4.57	0.99	11.5	0	0.99	
Average area	4.07	2.69	0	1.17	2.27	0	1	1.32	0.66	3.32	0	2	
K3 Buyers	104.25	303	3.5	6	262.5	1.5	7.5	39.75	1.25	64	60	3	856.25
%age share	12.18	35.39	0.41	0.7	30.66	0.18	0.88	4.64	0.15	7.47	7.01	0.35	
Average area	4.53	6.18	0.875	2	5.35	0.75	1.5	1.99	0.62	2.78	30	1.5	
All K3 Buyers	161.25	359.5	3.5	9.5	310.25	1.5	8.5	49	3.25	87.25	60	5	1058.5
%age share	15.23	33.96	0.33	0.9	29.31	0.14	0.8	4.63	0.31	8.24	5.67	0.47	
Average area	4.36	5.13	0.875	1.58	4.43	0.75	1.42	1.81	0.65	2.91	30	1.66	
Non-K3 buyers	66	141.5	1.5	1.25	129.5	2	0.5	8.75	3.5	20.25	50	0	424.75
%age share	15.54	33.31	0.35	0.29	30.49	0.47	0.12	2.06	0.82	4.77	11.77	0	
Average area	3	3.37	0.75	0.62	3.08	1	0.5	0.73	1.75	1.45	50	0	
Farmers in Lakhimpur	222	315	0	0	315	0	0	0	0	0	110	0	962
%age share	23.08	32.74	0	0	32.74	0	0	0	0	0	11.43	0	
Average area	3.96	4.92	0	0	4.92	0	0	0	0	0	36.66	0	
K3 Exclusive Buyers	57	28.5	0	0	28.5	0	0	0	0	0	0	0	114
%age share	50	25	0	0	25	0	0	0	0	0	0	0	
Average area	4.07	2.04	0	0	2.03	0	0	0	0	0	0	0	
K3 Buyers	104.25	188.75	0	0	188.75	0	0	0	0	0	60	0	541.75
%age share	19.24	34.84	0	0	34.84	0	0	0	0	0	11.08	0	
Average area	4.53	7.26	0	0	7.26	0	0	0	0	0	30	0	
all K3 Buyers	161.25	217.25	0	0	217.25	0	0	0	0	0	60	0	655.75
%age share	24.59	33.13	0	0	33.13	0	0	0	0	0	9.15	0	
Average area	4.36	5.43	0	0	5.43	0	0	0	0	0	30	0	
non-K3 Buyers	60.75	97.75	0	0	97.75	0	0	0	0	0	50	0	306.25
%age share	19.84	31.92	0	0	31.92	0	0	0	0	0	16.33	0	
Average area	3.2	4.07	0	0	4.07	0	0	0	0	0	50	0	
Farmers in Barabanki	5.25	186	5	10.75	124.75	3.5	9	57.75	6.75	107.5	0	5	521.25
%age share	1.01	35.68	0.96	2.06	23.93	0.67	1.73	11.08	1.29	20.62	0	0.96	
Average area	1.75	3.87	0.83	1.34	2.6	0.87	1.28	1.48	0.96	2.44	0	1.66	

K3 Exclusive Buyers	0	28	0	3.5	19.25	0	1	9.25	2	23.25	0	2	88.25
%age share	0	31.73	0	3.97	21.81	0	1.13	10.48	2.27	26.35	0	2.27	
Average area	0	1.86	0	1.17	2.75	0	1	1.32	0.66	3.32	0	2	
K3 Buyers	0	114.25	3.5	6	73.75	1.5	7.5	39.75	1.25	64	0	3	314.5
%age share	0	36.33	1.11	1.91	23.45	0.48	2.38	12.64	0.4	20.35	0	0.95	
Average area	0	4.96	0.87	2	3.21	0.75	1.5	1.99	0.62	2.78	0	1.5	
All K3 Buyers	0	142.25	3.5	9.5	93	1.5	8.5	49	3.25	87.25	0	5	402.75
%age share	0	35.32	0.87	2.36	23.09	0.37	2.11	12.17	0.81	21.66	0	1.24	
Average area	0	4.74	0.87	1.58	3.1	0.75	1.42	1.81	0.65	2.91	0	1.66	
Non-K3 Buyers	5.25	43.75	1.5	1.25	31.75	2	0.5	8.75	3.5	20.25	0	0	118.5
%age share	4.43	36.92	1.27	1.05	26.79	1.69	0.42	7.38	2.95	17.09	0	0	
Average area	1.75	2.43	0.75		1.76	1	0.5	0.73	1.75	1.45	0	0	

Source: primary data

Table 4.18: Farmer category and district wise cropping pattern of farmers

Season>	**Annual**	**Kharif**			**Rabi**					***Zaid***			
Parameter (district and % of GCA and average area in acres)	**Sugarcane**	**Paddy**	**Maize**	**Pulses**	**Wheat**	**Green Pea**	***Masoor***	**Mustard**	**Potato**	**Mentha**	**Paddy2**	**Vegetables**	**Gross Area**
Area sown by all farmers	227.25	501	5	10.75	439.75	3.5	9	57.75	6.75	107.5	110	5	1483.25
%age	15.32	33.78	0.34	0.72	29.65	0.24	0.61	3.89	0.46	7.25	7.42	0.34	
Average	3.85	4.47	0.83	1.34	3.92	0.87	1.28	1.48	0.96	2.44	36.67	1.66	
Marginal Farmers	17.75	41	0.5	1.75	35.25	0.5	0	7	0.5	16	0	0	120.25
%age	14.76	34.1	0.42	1.46	29.31	0.42	0	5.82	0.42	13.31	0	0	
Average	1.11	1.08	0.5	0.58	0.93	0.5	0	0.64	0.5	1	0	0	
Small Farmers	42	89.25	4.5	3	68.5	1	1	24.25	2	34	0	2	271.5
%age	15.47	32.87	1.66	1.1	25.23	0.37	0.37	8.93	0.74	12.52	0	0.74	
Average	2.47	2.63	0.9	1	2.01	1	0.5	1.43	1	2	0	2	
Semi Medium Farmers	76	111	0	6	89.5	2	4	17.5	4	34.5	0	0.5	345
%age	22.03	32.17	0	1.74	25.94	0.58	1.16	5.07	1.16	10	0	0.14	
Average	4.75	4.63	0	3	3.73	1	1.33	2.19	1.33	4.31	0	0.5	
Medium farmers	71.5	114.75	0	0	101.5	0	4	9	0.25	23	0	2.5	326.5
%age	21.9	35.15	0	0	31.09	0	1.23	2.76	0.08	7.04	0	0.77	
Average	7.94	9.56	0	0	8.46	0	2	3	0.25	7.67	0	2.5	
Large farmers	20	145	0	0	145	0	0	0	0	0	110	0	420
%age	4.76	34.52	0	0	34.52	0	0	0	0	0	26.19	0	
Average	20	36.25	0	0	36.25	0	0	0	0	0	36.67	0	
Lakhimpur	222	315	0	0	315	0	0	0	0	0	110	0	962
%age	23.08	32.74	0	0	32.74	0	0	0	0	0	11.43	0	

Average	3.96	4.92	0	0	4.92	0	0	0	0	0	36.67	0	
Marginal Farmers	15	15.5	0	0	15.5	0	0	0	0	0	0	0	46
%age	32.61	33.7	0	0	33.7	0	0	0	0	0	0	0	
Average	1.07	0.82	0	0	0.82	0	0	0	0	0	0	0	
Small Farmers	39.5	24	0	0	24	0	0	0	0	0	0	0	87.5
%age	45.14	27.43	0	0	27.43	0	0	0	0	0	0	0	
Average	2.47	1.5	0	0	1.5	0	0	0	0	0	0	0	
Semi Medium Farmers	76	54	0	0	54	0	0	0	0	0	0	0	184
%age	41.3	29.35	0	0	29.35	0	0	0	0	0	0	0	
Average	4.75	3.38	0	0	3.38	0	0	0	0	0	0	0	
Medium farmers	71.5	76.5	0	0	76.5	0	0	0	0	0	0	0	224.5
%age	31.85	34.08	0	0	34.08	0	0	0	0	0	0	0	
Average	7.94	8.5	0	0	8.5	0	0	0	0	0	0	0	
Large farmers	20	145	0	0	145	0	0	0	0	0	110	0	420
%age	4.76	34.52	0	0	34.52	0	0	0	0	0	26.19	0	
Average	20	36.25	0	0	36.25	0	0	0	0	0	36.67	0	
Barabanki	5.25	186	5	10.75	124.75	3.5	9	57.75	6.75	107.5	0	5	521.25
%age	1.01	35.68	0.96	2.06	23.93	0.67	1.73	11.08	1.29	20.62	0	0.96	
Average	1.75	3.87	0.83	1.34	2.6	0.87	1.28	1.48	0.96	2.44	0	1.66	
Marginal Farmers	2.75	25.5	0.5	1.75	19.75	0.5	0	7	0.5	16	0	0	74.25
%age	3.7	34.34	0.67	2.36	26.6	0.67	0	9.43	0.67	21.55	0	0	
Average	1.38	1.34	0.5	0.58	1.04	0.5	0	0.64	0.5	1	0	0	
Small Farmers	2.5	65.25	4.5	3	44.5	1	1	24.25	2	34	0	2	184
%age	1.36	35.46	2.45	1.63	24.18	0.54	0.54	13.18	1.09	18.48	0	1.09	
Average	2.5	3.63	0.9	1	2.47	1	0.5	1.43	1	2	0	2	
Semi Medium Farmers	0	57	0	6	35.5	2	4	17.5	4	34.5	0	0.5	161
%age	0	35.4	0	3.73	22.05	1.24	2.48	10.87	2.48	21.43	0	0.31	
Average	0	7.13	0	3	4.44	1	1.33	2.19	1.33	4.31	0	0.5	
Medium farmers	38.25		0	0	25	0	4	9	0.25	23	0	2.5	102
%age	37.5	0	0	0	24.51	0	3.92	8.82	0.25	22.55	0	2.45	
Average	12.75		0	0	8.33	0	2	3	0.25	7.67	0	2.5	

Source: primary data

It was mostly paddy seed and wheat seed which were bought from the market by all types of farmers and there were no differences across categories or districts (table 4.19 and 4.20). Very few farmers bought sugarcane seed while every farmer bought wheat and paddy seed irrespective of farm size category.

Similarly, all farmers used chemical fertilisers except one in Barabanki (table 4.21 and 4.22). Micro nutrient use was higher among K3 buyers than by non-buyers and lower for *zaid* crops in Barabanki. (table 4.23 and 4.24) PGPs were mostly used in *rabi* and *zaid* crops and not much in sugarcane or *kharif* paddy across categories and districts (tables 4.25 and 4.26).

Table 4.19: Distribution of farmers by category and season for Purchase of seeds

Crop and season	**Annual Crop (Sugarcane)**		**Kharif Crop Paddy**		**Rabi Crop Wheat**		***Zaid* Crops**		***Zaid* Crop Paddy**	
Farmer category and district	**Buyer**	**Non Buyer**	**Buyer**	**Non Buyer**	**Buyer**	**Non Buyer**	**Buyer**	**Non Buyer**	**Buyer**	**Non Buyer**
Lakhimpur	2	54	64	0	64	0	0	0	3	0
Lakhimpur%	3.39	91.53	57.14	0	57.14	0	0	0	100	0
K3 exclusive Buyer	0	14	14	0	14	0	0	0	0	0
K3 exclusive Buyer %	0	23.73	12.5	0	12.50	0	0	0	0	0
K3 Buyer	0	23	26	0	26	0	0	0	2	0
K3 Buyer %	0	38.98	23.21	0	23.21	0	0	0	66.67	0
K3 (jointly)Buyer	0	37	40	0	40	0	0	0	2	0
K3 (jointly)Buyer %	0	62.71	35.71	0	35.71	0	0	0	66.67	0
Non K3 Buyer	2	17	24	0	24	0	0	0	1	0
Non K3 Buyer %	3.39	28.81	21.43	0	21.43	0	0	0	33.33	0
Barabanki	0	3	48	0	48	0	7	38	0	0
Barabanki %	0	5.08	42.86	0	42.86	0	15.91	86.36	0	0
K3 exclusive Buyer	0	0	7	0	7	0	0	7	0	0
K3 exclusive Buyer %	0	0	6.25	0	6.25	0	0	15.91	0	0
K3 Buyer	0	0	23	0	23	0	3	21	0	0
K3 Buyer %	0	0	20.54	0	20.54	0	6.82	47.73	0	0
K3 (jointly)Buyer	0	0	30	0	30	0	3	28	0	0
K3 (jointly)Buyer %	0	0	26.78	0	26.78	0	6.82	63.64	0	0
Non K3 Buyer2	0	3	18	0	18	0	4	10	0	0
Non K3 Buyer2 %	0	5.08	16.07	0	16.07	0	9.09	22.73	0	0
Total of both districts	2	57	112	0	112	0	7	38	3	0
Total of both districts %	3.39	96.61	100	0	100	0	15.91	86.36	100	0
Note:	out of 59 farmers		out of 112 farmers				out of 44 farmers		out of 3 farmers	

Table 4.20: Distribution of farmers by category and seasons wise Purchase of seeds

Season and crop	Sugarcane		Kharif Paddy		Rabi Crop Wheat		*Zaid* Crops		*Zaid* Paddy	
District, category and %age in total	Buyer	Non Buyer	Buyer	Non Buyer	Buyer	Non Buyer	Buyer	Non Buyer	Buyer	Non Buyer
Lakhimpur	2	54	64	0	64	0	0	0	3	0
%age	3.39	91.53	57.14	0	57.14	0	0	0	100	0
Marginal Farmers	1	13	19	0	19	0	0	0	0	0
%age	1.69	22.03	16.96	0	16.96	0	0	0	0	0
Small Farmers	0	16	16	0	16	0	0	0	0	0
%age	0	27.12	14.29	0	14.29	0	0	0	0	0
Semi Medium Farmers	1	15	16	0	16	0	0	0	0	0
%age	1.69	25.42	14.29	0	14.29	0	0	0	0	0
Medium farmers	0	9	9	0	9	0	0	0	0	0
%age	0	15.25	8.04	0	8.04	0	0	0	0	0
Large farmers	0	1	4	0	4	0	0	0	3	0
%age	0	1.69	3.57	0	3.57	0	0	0	100	0
Barabanki	0	3	48	0	48	0	7	37	0	0
%age	0	5.08	42.86	0	42.86	0	15.91	84.09	0	0
Marginal Farmers	0	2	19	0	19	0	3	13	0	0
%age	0	3.39	16.96	0	16.96	0	6.82	29.55	0	0
Small Farmers	0	1	18	0	18	0	1	16	0	0
%age	0	1.69	16.07	0	16.07	0	2.27	36.36	0	0
Semi Medium Farmers	0	0	8	0	8	0	3	5	0	0
%age	0	0	7.14	0	7.14	0	6.82	11.36	0	0
Medium farmers	0	0	3	0	3	0	0	3	0	0
%age	0	0	2.68	0	2.68	0	0	6.82	0	0
Total	2	57	112	0	112	0	7	37	3	0
%age	3.39	96.61	100	0	100	0	15.91	84.09	100	0

Source: primary data

Table 4.21: Distribution of farmers by buyer category and crop for chemical fertilizer purchase

Crop and season	Sugarcane		Kharif		Rabi		*Zaid*	
Farmer category and district	Buyer	Non Buyer	Buyer	Non Buyer	Buyer	Non Buyer	Buyer	Non Buyer
Lakhimpur	56	0	64	0	64	0	3	0
Lakhimpur%	94.91	0	57.14	0	57.14	0	6.38	0
K3 exclusive Buyer	14	0	14	0	14	0	0	0
K3 exclusive Buyer %	23.73	0	12.5	0	12.5	0	0	0
K3 Buyer	23	0	26	0	26	0	2	0
K3 Buyer %	38.98	0	23.21	0	23.21	0	4.26	0
K3 (jointly) Buyer	37	0	40	0	40	0	2	0
K3 (jointly) Buyer %	62.71	0	35.71	0	35.71	0	4.26	0
Non K3 Buyer	19	0	24	0	24	0	1	0
Non K3 Buyer %	32.20	0	21.43	0	21.43	0	2.12	0
Barabanki	2	0	48	0	47	1	44	0
Barabanki %	3.39	0	42.86	0	41.96	0.89	93.62	0
K3 exclusive Buyer	0	0	7	0	7	0	7	0
K3 exclusive Buyer %	0	0	6.25	0	6.25	0	14.89	0
K3 Buyer	0	0	23	0	23	0	23	0
K3 Buyer %	0	0	20.54	0	20.54	0	48.93	0
K3 (jointly) Buyer	0	0	30	0	30	0	30	0
K3 (jointly) Buyer %	0	0	26.78	0	26.78	0	63.83	0
Non K3 Buyer2	2	1	18	0	17	1	14	0
Non K3 Buyer2 %	3.39		16.07	0	15.18	89	29.79	0
Total of both districts	58	1	112	0	111	1	47	0
Total of both districts %	98.31	1.69	100	0	99.11	89	100	0

Source: primary data

Table 4.22: Distribution of farmers by land category and season for chemical fertilizer purchase

Season and crop	Annual Crop		Kharif		Rabi		*Zaid*	
District, category and %age in total	**Chemical fertilizer Buyer**	**Non Buyer**	**Chemical fertilizer Buyer**	**Non Buyer**	**Chemical fertilizer Buyer**	**Non Buyer**	**Chemical fertilizer Buyer**	**Non Buyer**
Lakhimpur	56	0	64	0	64	0	3	0
%age	94.92	0	57.14	0	57.14	0	6.38	0
Marginal Farmers	14	0	19	0	19	0	0	0
%age	23.73	0	16.96	0	16.96	0	0	0
Small Farmers	16	0	16	0	16	0	0	0
%age	27.12	0	14.29	0	14.29	0	0	0
Semi Medium Farmers	16	0	16	0	16	0	0	0
%age	27.12	0	14.29	0	14.29	0	0	0
Medium farmers	9	0	9	0	9	0	0	0
%ge	15.25	0	8.04	0	8.04	0	0	0
Large farmers	1	0	4	0	4	0	3	0
%age	1.69	0	3.57	0	3.57	0	6.38	0
Barabanki	2	0	48	0	47	1	44	0
%age	3.39	0	42.86	0	41.96	0.89	93.62	0
Marginal Farmers	1	1	19	0	18	1	17	0
%age	1.69	1.69	16.96	0	16.07	0.89	36.17	0
Small Farmers	1	0	18	0	18	0	16	0
%age	1.69	0	16.07	0	16.07	0	34.04	0
Semi Medium Farmers	0	0	8	0	8	0	8	0
%age	0	0	7.14	0	7.14	0	17.02	0
Medium farmers	0	0	3	0	3	0	3	0
%age	0	0	2.68	0	2.68	0	6.38	0
Total	58	1	112	0	111	1	47	0
%age	98.31	1.69	100	0	99.11	0.89	100	0

Source: primary data

Table 4.23: Distribution of farmers by buyer category and district and crop for micronutrient purchase

District, category and %age in total	**Sugarcane**		***Kharif***		***Rabi***		***Zaid***	
Inputs > Distt and type of buyer	**Micronutrients Buyer**	**Non Buyer**	**Micronutrients Buyer**	**Non Buyer**	**Micronutrients Buyer**	**Non Buyer**	**Micronutrients Buyer**	**Non Buyer**
Lakhimpur	53	3	64	0	58	6	3	0
Lakhimpur%	89.83	5.08	57.14	0	51.79	5.36	6.38	0
K3 exclusive Buyer	13	0	14	0	13	1	0	0
K3 exclusive Buyer %	22.03	0	12.50	0	11.61	0.89	0	0
K3 Buyer	23	1	26	0	25	1	2	0
K3 Buyer %	38.98	1.69	23.21	0	22.32	0.89	4.26	0
All K3 Buyer	36	1	40	0	38	2	2	0
All K3 Buyer %	61.02	1.69	35.71	0	33.93	1.79	4.26	0
Non K3 Buyer	17	2	24	0	20	4	1	0
Non K3 Buyer %	28.81	3.39	21.43	0	17.86	3.57	2.13	0
Barabanki	2	1	45	3	45	3	40	0
Barabanki %	3.39	1.69	40.18	2.68	40.18	2.68	85.11	0
K3 exclusive Buyer	0	0	7	0	7	0	7	0
K3 exclusive Buyer %	0	0	6.25	0	6.25	0	14.89	0
K3 Buyer	0	0	23	0	23	0	22	1
K3 Buyer %	0	0	20.54	0	20.54	0	46.81	2.13
All K3 Buyer	0	0	30	0	30	0	29	1
All K3 Buyer %	0	0	26.79	0	26.79	0	61.70	2.13
Non K3 Buyer2	2	1	15	3	15	3	11	3
Non K3 Buyer2 %	3.39	1.69	13.39	2.68	13.39	2.68	23.40	6.38
Total of both districts	55	4	109	3	103	9	43	4
Total %	93.22	6.78	97.32	2.68	91.96	8.04	91.53	8.51

Source: primary data

Table 4.24: Distribution of farmers by land category and season for micronutrients purchase

Season	Annual Crop		*Kharif*		*Rabi*		*Zaid*	
District, category and %age in total	**Buyer**	**Non Buyer**	**Buyer**	**Non Buyer**	**Buyer**	**Non Buyer**	**Buyer**	**Non Buyer**
Lakhimpur	53	3	64	0	58	6	3	0
%age	89.83	5.08	57.14	0	51.79	5.36	6.38	0
Marginal Farmers	12	1	19	0	15	4	0	0
%age	20.34	1.69	16.96	0	13.39	3.57	0	0
Small Farmers	15	1	16	0	15	1	0	0
%age	25.42	1.69	14.29	0	13.39	0.89	0	0
Semi Medium Farmers	15	1	16	0	15	1	0	0
%age	25.42	1.69	14.29	0	13.39	0.89	0	0
Medium farmers	9	0	9	0	9	0	0	0
%age	15.25	0	8.04	0	8.04	0	0	0
Large farmers	2	0	4	0	4	0	3	0
%age	3.39	0	3.57	0	3.57	0	6.38	0
Barabanki	2	1	45	3	45	3	40	4
%age	3.39	1.69	40.18	2.68	40.18	2.68	85.11	8.51
Marginal Farmers	1	1	16	3	16	3	14	2
%age	1.69	1.69	14.29	2.68	14.29	2.68	29.79	4.26
Small Farmers	1	0	18	0	18	0	16	1
%age	1.69	0	16.07	0	16.07	0	34.04	2.13
Semi Medium Farmers	0	0	8	0	8	0	7	1
%age	0	0	7.14	0	7.14	0	14.89	2.13
Medium farmers	0	0	3	0	3	0	3	0
%age	0	0	2.68	0	2.68	0	6.38	0
Total	55	4	109	3	103	9	43	4
%age	93.22	6.78	97.32	2.68	91.96	8.04	91.49	8.51

Source: primary data

Chemical pesticides were widely used across crops and seasons and farmer categories except in *rabi* where one-third farmers did not use them. Non-K3 buyers especially in Barabanki used much less pesticides (table 4.25 and 4.26). Weedicides were more commonly used in *Kharif* paddy crops and *zaid* paddy (tables 4.27 and 4.28). Fungicides were more common among K3 farmers than among non-K3 farmers but only 1/3 to 50% of farmers across crops and categories used it. It was much less used in sugarcane and wheat (tables 4.29 and 4.30). Micronutrients were used more by large and medium farmers in Lakhimpur as well as in Barabanki in wheat and paddy but in sugarcane in Lakhimpur, it was smaller farmers who bought less of micro nutrients (tables 4.31 and 4.32). PGPs were used more in *rabi* (wheat) and *zaid c*rops and very few farmers used it in sugarcane and paddy. Small, semi-medium and medium farmers used more PGPs in a relative sense. Small and marginal farmers bought more of agril implements than their larger counterparts. Biofertilisers and bio-pesticides were not at all common farmers across categories (tables 4.33-4.35). Only two farmers bought biofertilisers and in Barabanki, none bought biopesticides and even in Lakhimpur, it

was 5% farmers who bought it and all of them were K3 buyers wholly or partly. No non-K3 buyer bought any biopesticides. It was bought more by small and semi-medium farmers in Lakhimpur alone (table 4.36). Lakhimpur farmers bought more of agril implements and that too was bought more by K3 buyers though those were not exclusive buyers (table 4.37).

Table 4.25: Distribution of farmers by crop, season and category for PGPs purchase

Season	**Annual Crop**		***Kharif***		***Rabi***		***Zaid***	
Buying type> District and farmer category	**PGPs Buyer**	**Non Buyer**	**PGPs Buyer**	**Non Buyer**	**PGPs Buyer**	**Non Buyer**	**PGPs Buyer**	**Non Buyer**
Lakhimpur	7	49	10	54	17	47	1	2
Lakhimpur%	11.86	83.05	8.93	48.21	15.18	41.96	2.13	4.26
K3 exclusive Buyer	2	12	2	12	2	12	0	0
K3 exclusive Buyer %	3.39	20.34	1.79	10.71	1.79	10.71	0	0
K3 Buyer	5	18	8	18	13	13	1	1
K3 Buyer %	8.47	30.51	7.14	16.07	11.61	11.61	2.13	2.13
All K3 Buyer	7	30	10	30	15	25	1	1
All K3 Buyer %	11.86	50.85	8.93	26.79	13.39	22.32	2.13	2.13
Non K3 Buyer	0	19	0	24	2	22	0	1
Non K3 Buyer %	0	32.20	0	21.43	1.79	19.64	0	2.13
Barabanki	0	3	9	39	30	18	33	11
Barabanki %	0	5.08	8.04	34.82	26.79	16.70	70.21	23.40
K3 exclusive Buyer	0	0	2	5	6	1	6	1
K3 exclusive Buyer %	0	0	1.79	4.46	5.36	0.89	12.77	2.13
K3 Buyer	0	0	3	20	14	9	17	6
K3 Buyer %	0	0	2.68	17.86	12.50	8.04	36.17	12.77
All K3 Buyer	0	0	5	25	20	10	23	7
All K3 Buyer %	0	0	4.46	22.32	17.86	8.93	48.94	14.89
Non K3 Buyer2	0	3	4	14	10	8	10	4
Non K3 Buyer2 %	0	5.08	3.57	12.50	8.93	7.14	21.28	8.51
Total of both districts	7	52	19	93	47	65	34	13
Total of both districts %	11.86	88.14	16.96	83.04	41.96	58.04	72.34	27.66

Source: primary data

Table 4.26: Distribution of farmers, by category, crop and season for PGPs purchase

Crop Season>	**Annual Crop**		***Kharif***		***Rabi***		***Zaid***	
District, category, and %age in total	**PGPs Buyer**	**Non Buyer**	**PGPs Buyer**	**Non Buyer**	**PGPs Buyer**	**Non Buyer**	**PGPs Buyer**	**Non Buyer**
Lakhimpur	7	49	10	54	17	47	1	2
%age	11.86	83.05	8.93	48.21	15.18	41.96	2.13	4.26
Marginal Farmers	1	13	1	18	4	15	0	0
%age	1.69	22.03	0.89	16.07	3.57	13.39	0	0
Small Farmers	3	13	4	12	4	12	0	0
%age	5.08	22.03	3.57	10.71	3.57	10.71	0	0
Semi Medium Farmers	1	15	3	13	3	13	0	0
%age	1.69	25.42	2.68	11.61	2.68	11.61	0	0
Medium farmers	2	7	2	7	5	4	0	0
%age	3.39	11.86	1.79	6.25	4.46	3.57	0	0
Large farmers	0	1	0	4	1	3	1	2
% age	0	1.69	0	3.57	0.89	2.68	2.13	4.26
Barabanki	0	3	9	39	30	18	33	11

%age	0	5.08	8.04	34.82	26.79	16.07	70.21	23.40
Marginal Farmers	0	2	3	16	12	7	13	4
%age	0	3.39	2.68	14.29	10.71	6.25	27.66	8.51
Small Farmers	0	1	5	13	13	5	14	2
%age	0	1.69	4.46	11.61	11.61	4.46	29.79	4.26
Semi Medium Farmers	0	0	1	7	3	5	3	5
%age	0	0	0.89	6.25	2.68	4.46	6.38	10.64
Medium farmers	0	0	0	3	2	1	3	0
% age	0	0	0	2.68	1.79	0.89	6.38	0
Total	7	52	19	93	47	65	34	13
%age	11.86	88.14	16.96	83.04	41.96	58.04	72.34	27.66

Source; primary survey

Table 4.27: Distribution of farmers by buyer category and district and crop for chemical pesticides purchase

Season	**Annual Crop**		***Kharif***		***Rabi***		***Zaid***	
District and farmer category	**Pesticides Buyer**	**Non Buyer**	**Pesticides Buyer**	**Non Buyer**	**Pesticides Buyer**	**Non Buyer**	**Pesticides Buyer**	**Non Buyer**
Lakhimpur	56	0	62	2	39	25	3	0
Lakhimpur%	94.92	0	55.36	1.79	34.82	22.32	6.38	0
K3 exclusive Buyer	14	0	13	1	9	5	0	0
K3 exclusive Buyer %	23.73	0	11.61	0.89	8.04	4.46	0	0
K3 Buyer	23	0	26	0	20	6	2	0
K3 Buyer %	38.98	0	23.31	0	17.86	5.36	4.26	0
All K3 Buyer	37	0	39	1	29	11	2	0
All K3 Buyer %	62.71	0	34.82	0.89	25.89	9.82	4.26	0
Non K3 Buyer	19	0	23	1	10	14	1	0
Non K3 Buyer %	32.20	0	20.54	0.89	8.93	12.50	2.13	0
Barabanki	2	1	44	4	32	16	42	0
Barabanki %	3.39	1.69	39.29	3.67	28.57	14.29	89.36	0
K3 exclusive Buyer	0	0	7	0	6	1	7	0
K3 exclusive Buyer %	0	0	6.25	0	5.36	8.90	14.89	0
K3 Buyer	0	0	23	0	16	7	23	0
K3 Buyer %	0	0	20.54	0	14.29	6.25	48.94	0
All K3 Buyer	0	0	30	0	22	8	30	0
All K3 (Buyer %	0	0	26.79	0	19.64	7.14	63.83	0
Non K3 Buyer	2	1	14	4	10	8	12	2
Non K3 Buyer %	3.39	1.69	12.50	3.57	8.93	7.14	25.53	4.26
Total of both districts	58	1	106	6	71	41	45	2
Total of both districts %	98.31	1.69	94.64	5.36	63.39	36.61	95.74	4.26

Source: primary data

Table 4.28: Distribution of farmers by land category, season and crop for chemical pesticides purchase

Season	Annual Crop		*Kharif*		*Rabi*		*Zaid*	
Buyer type> District, category and %age in total	**Chemical Pesticides Buyer**	**Non Buyer**	**Chemical Pesticides Buyer**	**Non Buyer**	**Chemical Pesticides Buyer**	**Non Buyer**	**Chemical Pesticides Buyer**	**Non Buyer**
Lakhimpur	56	0	62	2	39	25	3	0
%age	94.92	0	55.36	1.79	34.82	22.32	6.38	0
Marginal Farmers	14	0	19	0	7	12	0	0
%age	23.73	0	16.96	0	6.25	10.71	0	0
Small Farmers	16	0	14	2	10	6	0	0
%age	27.12	0	12.50	1.79	8.93	5.36	0	0
Semi Medium Farmers	16	0	16	0	13	3	0	0
%age	27.12	0	14.29	0	11.61	2.68	0	0
Medium farmers	9	0	9	0	6	3	0	0
%age	15.25	0	8.04	0	5.36	2.68	0	0
Large farmers	1	0	4	0	3	1	3	0
%age	1.69	0	3.57	0	2.68	0.89	6.38	0
Barabanki	2	1	44	4	32	16	42	2
%age	3.39	1.69	39.29	3.57	28.57	14.29	89.36	4.26
Marginal Farmers	1	1	17	2	12	7	16	1
%age	1.69	1.69	15.18	1.79	10.71	6.25	34.04	2.13
Small Farmers	1	0	16	2	12	6	16	0
%age	1.69	0	14.29	1.79	10.71	5.36	34.04	0
Semi Medium Farmers	0	0	8	0	6	2	7	1
%age	0	0	7.14	0	5.36	1.79	14.89	2.13
Medium farmers	0	0	3	0	2	1	3	0
%age	0	0	2.68	0	1.79	0.89	6.38	0
Total	58	1	106	6	71	41	45	2
%age	98.31	1.69	94.64	5.36	63.39	36.61	95.74	4.26

Source: primary data

Table 4.29: Distribution of farmers by buyer category and crop and seasons for weedicide purchase

Season	Annual Crop		*Kharif*		*Rabi*		*Zaid*	
Buyer type> District and farmer category	**Weedicide Buyer**	**Non Buyer**	**Weedicide Buyer**	**Non Buyer**	**Weedicide Buyer**	**Non Buyer**	**Weedicide Buyer**	**Non Buyer**
Lakhimpur	33	23	56	8	36	28	3	0
Lakhimpur%	55.93	38.98	50	7.14	32.14	25	6.38	0
K3 exclusive Buyer	6	8	11	3	6	8	0	0
K3 exclusive Buyer %	10.17	13.56	9.82	2.68	5.36	7.14	0	0
K3 Buyer	14	9	23	3	19	7	2	0
K3 Buyer %	23.73	15.25	20.54	2.68	16.96	6.25	4.26	0
All K3 Buyer	20	17	34	6	25	15	2	0
All K3 Buyer %	33.90	28.81	30.36	5.36	22.32	13.39	4.26	0
Non K3 Buyer	13	6	22	2	11	13	1	0
Non K3 Buyer %	22.03	10.17	19.64	1.79	9.82	11.61	2.13	0
Barabanki	0	3	46	2	36	12	33	11
Barabanki %	0	5.08	41.07	1.79	32.14	10.71	70.21	23.40
K3 exclusive Buyer	0	0	7	0	7	0	6	1
K3 exclusive Buyer %	0	0	6.25	0	6.25	0	12.77	2.13
K3 Buyer	0	0	23	0	18	5	18	5
K3 Buyer %	0	0	20.54	0	16.07	4.46	38.30	10.64
All K3 Buyer	0	0	30	0	25	5	24	6
All K3 Buyer %	0	0	26.79	0	22.32	4.46	51.06	12.77
Non K3 Buyer2	0	3	16	2	11	7	9	5
Non K3 Buyer2 %	0	5.08	14.29	1.79	9.82	6.25	19.15	10.64
Total of both districts	33	26	102	10	72	40	36	11
Total of both districts %	55.93	44.07	91.07	8.93	64.29	35.71	76.60	23.40

Source: primary data

Table 4.30: Distribution of farmers by land category, season and crop for weedicide purchase

Season	Annual Crop		*Kharif*		*Rabi*		*Zaid*	
Buyer type> District, category and %age in total	**Weedicide Buyer**	**Non Buyer**	**Weedicide Buyer**	**Non Buyer**	**Weedicide Buyer**	**Non Buyer**	**Weedicide Buyer**	**Non Buyer**
Lakhimpur	33	23	56	8	36	28	3	0
%age	55.93	38.98	50	7.14	32.14	25	6.38	0
Marginal Farmers	8	6	17	2	8	11	0	0
%age	13.56	10.17	15.18	1.79	7.14	9.82	0	0
Small Farmers	9	7	14	2	10	6	0	0
%age	15.25	11.86	12.50	1.79	8.93	5.36	0	0
Semi Medium Farmers	11	5	14	2	8	8	0	0
%age	18.64	8.47	12.50	1.79	7.14	7.14	0	0
Medium farmers	5	4	7	2	6	3	0	0
%age	8.47	6.78	6.25	1.79	5.36	2.68	0	0
Large farmers	0	1	4	0	4	0	3	0
%age	0	1.69	3.57	0	3.57	0	6.38	0
Barabanki	0	3	46	2	36	12	33	11
%age	0	5.08	41.07	1.79	32.14	10.71	70.21	23.40
Marginal Farmers	0	2	18	1	12	7	8	9
%age	0	3.39	16.07	0.89	10.71	6.25	17.02	19.15
Small Farmers	0	1	18	0	14	4	15	1
%age	0	1.69	16.07	0	12.50	3.57	31.91	2.13
Semi Medium Farmers	0	0	7	1	7	1	7	1
%age	0	0	6.25	0.89	6.25	0.89	14.89	2.13
Medium farmers	0	0	3	0	3	0	3	0
%age	0	0	2.68	0	2.68	0	6.38	0
Total	33	26	102	10	72	40	36	11
%age	55.93	44.07	91.07	8.93	64.29	35.71	76.60	23.40

Source: primary data

Table 4.31: Distribution of farmers and crop, seasons and buyer category for fungicide purchase

Seasons and crops	Annual Crop		*Kharif*		*Rabi*		*Zaid*	
Byer type> District, and farmer type	**Fungicide Buyer**	**Non Buyer**	**Fungicide Buyer**	**Non Buyer**	**Fungicide Buyer**	**Non Buyer**	**Fungicide Buyer**	**Non Buyer**
Lakhimpur	20	36	23	41	19	45	3	0
Lakhimpur%	33.90	61.02	20.54	36.61	16.96	40.18	6.38	0
K3 exclusive Buyer	7	7	4	10	5	9	0	0
K3 exclusive Buyer %	11.86	11.86	3.57	8.93	4.46	8.04	0	0
K3 Buyer	10	13	12	14	9	17	2	0
K3 Buyer %	16.95	22.03	10.71	12.50	8.04	15.18	4.26	0
All K3 Buyer	17	20	16	24	14	26	2	0
All K3 Buyer %	28.81	33.90	14.29	21.43	12.50	23.21	4.26	0
Non K3 Buyer	3	16	3	21	5	19	1	0
Non K3 Buyer %	5.08	27.12	2.68	18.75	4.46	16.96	2.13	0
Barabanki	1	2	24	24	24	24	23	21
Barabanki %	1.69	3.39	21.43	21.43	21.43	21.43	48.94	44.68
K3 exclusive Buyer	0	0	6	1	5	2	7	0
K3 exclusive Buyer %	0	0	5.36	0.89	4.46	1.79	14.89	0
K3 Buyer	0	0	13	10	16	7	12	11
K3 Buyer %	0	0	11.61	8.93	14.29	6.25	25.53	23.40
All K3 Buyer	0	0	19	11	21	9	19	11
All K3 Buyer %	0	0	16.96	9.82	18.75	8.04	40.43	23.40
Non K3 Buyer2	1	2	5	13	3	15	4	10
Non K3 Buyer2 %	1.69	3.39	4.46	11.61	2.68	13.39	8.51	21.28
Total of both districts	21	38	47	65	43	69	26	21
Total of both districts %	35.59	64.41	41.96	58.04	38.39	61.61	55.32	44.68

Source: primary data

Table 4.32: Distribution of farmer by land category, crop and season by fungicide purchase

Season	Annual Crop		*Kharif*		*Rabi*		*Zaid*	
Buyer type> District, category and %age in total	**Fungicide Buyer**	**Non Buyer**	**Fungicide Buyer**	**Non Buyer**	**Fungicide Buyer**	**Non Buyer**	**Fungicide Buyer**	**Non Buyer**
Lakhimpur	20	36	23	41	19	45	3	0
%age	33.90	61.02	20.54	36.61	16.96	40.18	6.38	0
Marginal Farmers	4	10	7	12	5	14	0	0
%age	6.78	16.95	6.25	10.71	4.46	12.50	0	0
Small Farmers	8	8	3	13	4	12	0	0
%age	13.56	13.56	2.68	11.61	3.57	10.71	0	0
Semi Medium Farmers	6	10	5	11	3	13	0	0
%age	10.17	16.95	4.46	9.82	2.68	11.61	0	0
Medium farmers	1	8	4	5	3	6	0	0
%age	1.69	13.56	3.57	4.46	2.68	5.36	0	0
Large farmers	1	0	4	0	4	0	3	0
%age	1.69	0	3.57	0	3.57	0	6.38	0
Barabanki	1	2	24	24	24	24	23	21
%age	1.69	3.39	21.43	21.43	21.43	21.43	48.94	44.68
Marginal Farmers	0	2	7	12	6	13	7	10
%age	0	3.39	6.25	10.71	5.36	11.61	14.89	21.28
Small Farmers	1	0	10	8	10	8	8	8
%age	1.69	0	8.93	7.14	8.93	7.14	17.02	17.02
Semi Medium Farmers	0	0	4	4	5	3	5	3
%age	0	0	3.57	3.57	4.46	2.68	10.64	6.38
Medium farmers	0	0	3	0	3	0	3	0
%age	0	0	2.68	0	2.68	0	6.38	0
Total of both district	21	38	47	65	43	69	26	21
%age	35.59	64.41	41.96	58.04	38.39	61.61	55.32	44.68

Source: primary data

Table 4.33: Distribution of farmers by crop, buyer category and seasons for biofertilizer purchase

Buyer type > Distt, category of buyer and %age share	**Biofertilizer Buyer**	**Non Buyer**
Lakhimpur	2	62
Lakhimpur%	2	55
K3 exclusive Buyer	0	14
K3 exclusive Buyer %	0	12.5
K3 Buyer	1	25
K3 Buyer %	0.89	22.32
K3 (jointly)Buyer	1	39
K3 (jointly)Buyer %	0.89	34.82
Non K3 Buyer	1	23
Non K3 Buyer %	0.89	20.54
Barabanki	0	48
Barabanki %	0	42.86
K3 exclusive Buyer	0	7
K3 exclusive Buyer %	0	6.25
K3 Buyer	0	23
K3 Buyer %	0	20.54
K3 (jointly)Buyer	0	30
K3 (jointly)Buyer %	0	26.79
Non K3 Buyer2	0	18
Non K3 Buyer2 %	0	16.07
Total of both districts	2	110
Total of both districts %	1.79	98.21

Source: primary data

Table 4.34: Distribution of farmers by land category and season for biofertilizer purchase

Buyer type> District, category and %age in total	Biofertilizer Buyer	Non Buyer
Lakhimpur	2	62
%age	1.79	55.36
Marginal Farmers	0	19
%age	0	16.96
Small Farmers	0	16
%age	0	14.29
Semi Medium Farmers	1	15
%age	0.89	13.39
Medium farmers	1	8
%age	0.89	7.14
Large farmers	0	4
%age	0	3.57
Barabanki	0	48
%age	0	42.86
Marginal Farmers	0	19
%age	0	16.96
Small Farmers	0	18
%age	0	16.07
Semi Medium Farmers	0	8
%age	0	7.14
Medium farmers	0	3
%age	0	2.68
Total	2	110
%age	1.79	98.21

Table 4.35: Distribution of farmers by buyer category for bio-pesticide purchase

Buyer type> Distt, category and %age	Bio-pesticide Buyer	Non Buyer
Lakhimpur	6	58
Lakhimpur%	5.36	51.79
K3 exclusive Buyer	2	12
K3 exclusive Buyer %	1.79	10.71
K3 Buyer	4	22
K3 Buyer %	3.57	19.64
K3 (jointly)Buyer	6	34
K3 (jointly)Buyer %	5.6	30.36
Non K3 Buyer	0	24
Non K3 Buyer %	0	21.43
Total of both districts %	5.36	94.64

Table 4.36: Distribution of farmers by land category for bio-pesticide purchase

District, category and %age in total	Bio-pesticide Buyer	Non Buyer
Lakhimpur	6	58
%age	5.36	51.79
Marginal Farmers	1	18
%age	0.89	16.07
Small Farmers	2	14
%age	1.79	12.50
Semi Med Farmers	2	14
%age	1.79	12.50
Medium farmers	1	8
%age	0.89	7.14
Large farmers	0	4
%age	0	3.57
Barabanki	0	48
%age	0	42.86
Marginal Farmers	0	19
%age	0	16.96
Small Farmers	0	18
%age	0	16.07
Semi Med Farmers	0	8
%age	0	7.14
Medium farmers	0	3
%age	0	2.68
Total	6	106
%age	5.36	94.64

Table 4.37: Distribution of farmers by buyer category for purchase of agri implements

Buyer type> Farmer category and district	No. and %age of farmers
Lakhimpur	64
Lakhimpur%	57.14
K3 exclusive Buyer	14
K3 exclusive Buyer %	12.50
K3 Buyer	26
K3 Buyer %	23.31
K3 (jointly)Buyer	40
K3 (jointly)Buyer %	35.71
Non K3 Buyer	24
Non K3 Buyer %	21.43
Barabanki	48
Barabanki %	42.86
K3 exclusive Buyer	7
K3 exclusive Buyer %	6.25
K3 Buyer	23
K3 Buyer %	20.54
K3 (jointly)Buyer	30
K3 (jointly)Buyer %	26.79
Non K3 Buyer2	18
Non K3 Buyer2 %	16.07
Total of both districts	112
Total of both districts %	100

Source: primary data

Table 4.38: Distribution of farmers by land category for purchase of agri implements

District, category and %age in total	No. and %age of buyer
Lakhimpur	64
%age	57.14
Marginal Farmers	19
%age	16.96
Small Farmers	16
%age	14.29
Semi Medium Farmers	16
%age	14.29
Medium farmers	9
%age	8.04
Large farmers	4
%age	3.57
Barabanki	48
%age	42.86
Marginal Farmers	19
%age	16.96
Small Farmers	18
%age	16.07
Semi Medium Farmers	8
%age	7.14
Medium farmers	3
%age	2.68
Total	112
%age	100

Source: primary data

Table 4.39: Distribution of Non-K3 Buyers by category for terms of purchase of inputs

Terms of purchase> District and type of farmer	Buy on Cash	Buy on both cash & credit
Lakhimpur	10	14
%age	23.81	33.33
Marginal Farmers	6	6
%age	14.29	14.29
Small Farmers	2	3
%age	4.76	7.14
Semi Medium Farmers	1	3
% age	2.38	7.14
Medium farmers	1	1
%age	2.38	2.38
Large farmers	0	1
%age	0	2.38
Barabanki	13	5
%age	30.95	11.90
Marginal Farmers	7	4
% age	16.67	9.52
Small Farmers	4	1
%age	9.52	2.38
Semi Medium Farmers	2	0
%age	4.76	0
Total	23	19
% age	54.76	45.24

Source: primary data

In general, more of non-K3 farmers bought inputs on cash and more of Barabanki farmers bought them on cash and within the district, it was smaller holders who paid in cash more often. (tables 4.39, 4.40, and 4.41). On the other hand, K3 farmers in both districts largely bought it on cash. Most of the K3 farmers bought inputs on cash (83%) across categories and districts. In Lakhimpur only, some medium and large farmers bought on both credit and cash unlike Barabanki where it was mostly on cash basis that farmers bought inputs. On the other hand, in non-K3 group, 45% bought on cash and credit and even higher proportion in Lakhimpur bought it that way (60%).

Table 4.40: Distribution of K3 farmers by land category for terms of purchase of inputs

Terms of purchase> District and type of farmer	**Buy on Cash**	**Buy on both cash & credit**
Lakhimpur	30	10
%age	42.86	14.29
Marginal Farmers	5	2
%age	7.14	2.86
Small Farmers	10	1
%age	14.29	1.43
Semi Medium Farmers	10	2
%age	14.29	2.86
Medium farmers	3	4
% age	4.29	5.71
Large farmers	2	1
%age	2.86	1.43
Barabanki	28	2
% age	40	2.86
Marginal Farmers	6	2
% age	8.57	2.86
Small Farmers	13	0
% age	18.57	0
Semi Medium Farmers	6	0
%age	8.57	0
Medium farmers	3	0
% age	4.29	0
Total	58	12
% age	82.86	17.14

Source: primary data

Table 4.41: Distribution of K3 Buyers by category and terms of purchase of inputs

Terms of purchase> District and type of farmer	Buy on Cash	Buy on both cash & credit
Lakhimpur	40	24
%age	62.5	37.5
K3- Exclusive Buyers	14	0
%age	21.88	0
K3 Buyers	16	10
%age	25	15.63
K3 all buyers	30	10
%age	46.88	15.63
Non K3 Buyers	10	14
%age	15.63	21.88
Barabanki	41	7
%age	85.42	14.58
K3- Exclusive Buyers	7	0
%age	14.58	0
K3 Buyers	21	2
%age	43.75	4.17
K3 all buyers	28	2
%age	58.33	4.17
Non K3 Buyers	13	5
%age	27.08	10.42
Total	81	31
%age	72.32	27.68
All K3- Exclusive Buyers	21	0
%age	18.75	0
K3 Buyers	37	12
%age	33.04	10.71
All K3 Buyers	58	12
%age	51.79	10.71
Total non K3 Buyers	23	19
%age	20.54	16.96

Source: primary data

In terms of quality and effectiveness of service by K3 outlets, the shortage of inputs was reported mainly by small, marginal and semi-medium farmers in both district with 87% farmers reporting it and mainly in chemical fertilisers and to some extent in seed (tables 4.42, 4.43 and 4.44). The major dimension reported was shortage in season. Even in each district, the picture was similar though farmers also reported a combination of inputs for shortage and multiple dimensions for shortage. Further, a higher proportion of non-exclusive buyers reported shortage at K3 outlets though it was mainly seasonal shortage and mainly of fertilisers and seeds, to some extent.

Table 4.42: District and Category wise farmer perception of shortage of agri-input at K3 centres

Perception of shortage and nature of shortage> District, category and % in total of K3 buyers (70)	Faced any shortage of agri-input at K3	Not faced any shortage of agri-input at K3	Faced Shortage of Seeds	Faced Shortage of Chemical fertilizer	Faced Shortage of Chemical pesticides	Faced Shortage of Herbicide/weedicide	Seasonal Shortage	Not available in required packaging	Not available at required time
Lakhimpur	35	5	7	35	1	1	35	2	2
%age	50	7.14	10	50	1.43	1.43	50	2.86	2.86
Marginal Farmers	5	2	1	5	0	0	5	0	1
%age	7.14	2.86	1.43	7.14	0	0	7.14	0	1.43
Small Farmers	11	0	2	11	0	0	11	1	0
%age	15.71	0	2.86	15.71	0	0	15.71	1.43	0
Semi Medium Farmers	9	2	1	9	0	0	9	0	0
%age	12.86	2.86	1.43	12.86	0	0	12.86	0	0
Medium farmers	7	1	2	7	0	1	7	1	1
%age	10	1.43	2.86	10	0	1.43	10	1.43	1.43
Large farmers	3	0	1	3	1	0	3	0	0
%age	4.29	0	1.43	4.29	1.43	0	4.29	0	0
Barabanki	26	4	4	24	0	0	26	0	0
%age	37.14	5.71	5.71	34.29	0	0	37.14	0	0
Marginal Farmers	8	0	0	8	0	0	8	0	0
%age	11.43	0	0	11.43	0	0	11.43	0	0
Small Farmers	11	2	2	10	0	0	11	0	0
%age	15.71	2.86	2.86	14.29	0	0	15.71	0	0
Semi Medium Farmers	5	1	1	4	0	0	5	0	0
%age	7.14	1.43	1.43	5.71	0	0	7.14	0	0
Medium farmers	2	1	1	2	0	0	2	0	0
%age	2.86	1.43	1.43	2.86	0	0	2.86	0	0
Total	61	9	11	59	1	1	61	2	2
%age	87.14	12.86	15.71	84.29	1.43	1.43	87.14	2.86	2.86

Table 4.43: District and category wise distribution of farmers for shortage of agri-input at K3

Shortage and input> / District, category and %in total	Faced any shortage of agri-input at K3	Not faced any shortage of agri-input at K3	Faced Shortage of Seeds	Faced Shortage of Chemical fertilizer	Faced Shortage of Seeds & Chemical fertilizer	Faced Shortage of Chemical fertilizer & Chemical pesticides	Faced Shortage of Chemical fertilizer & Herbicide/ weedicide	Seasonal Shortage	Seasonal Shortage & Not available in required packaging	Seasonal Shortage & Not available at required time
Lakhimpur	35	5	0	26	7	1	1	31	2	2
%age	87.5	12.5	0	65	17.5	2.5	2.5	77.5	5	5
Marginal Farmers	5	2	0	4	1	0	0	4	1	0
%age	12.5	5	0	10	2.5	0	0	10	2.5	0
Small Farmers	11	0	0	9	2	0	0	10	0	1
%age	27.5	0	0	22.5	5	0	0	25	0	2.5
Semi Medium Farmers	10	2	0	9	1	0	0	10	0	0
%age	25	5	0	22.5	2.5	0	0	25	0	0
Medium farmers	6	1	0	3	2	0	1	4	1	1
%age	15	2.5	0	7.5	5	0	2.5	10	2.5	2.5
Large farmers	3	0	0	1	1	1	0	3	0	0
%age	7.5	0	0	2.5	2.5	2.5	0	7.5	0	0
Barabanki	26	4	2	22	2	0	0	26	0	0
%age	86.67	13.33	6.67	73.33	6.67	0	0	86.67	0	0
Marginal Farmers	8	0	0	8	0	0	0	8	0	0
%age	26.67	0	0	26.67	0	0	0	26.67	0	0
Small Farmers	11	2	1	9	1	0	0	11	0	0
%age	36.67	6.67	3.33	30	3.33	0	0	36.67	0	0
Semi Medium Farmers	5	1	1	4	0	0	0	5	0	0
%age	16.67	3.33	3.33	13.33	0	0	0	16.67	0	0
Medium farmers	2	1	0	1	1	0	0	2	0	0
%age	6.67	3.33	0	3.33	3.33	0	0	6.67	0	0
Total	61	9	2	48	9	1	1	57	2	2
%age	87.14	12.86	2.86	68.57	12.86	1.43	1.43	81.43	2.86	2.86
Marginal Farmers	13	2	0	12	1	0	0	12	1	0
%age	18.57	2.86	0	17.14	1.43	0	0	17.14	1.43	0
Small Farmers	22	2	1	18	3	0	0	21	0	1
%age	31.43	2.86	1.43	25.71	4.29	0	0	30	0	1.43
Semi Medium Farmers	15	3	1	13	1	0	0	15	0	0
%age	21.43	4.29	1.43	18.57	1.43	0	0	21.43	0	0
Medium farmers	8	2	0	4	3	0	1	6	1	1
%age	11.43	2.86	0	5.71	4.29	0	1.43	8.57	1.43	1.43
Large farmers	3	0	0	1	1	1	0	3	0	0
%age	4.29	0	0	1.43	1.43	1.43	0	4.29	0	0

Table 4.44: Distribution of farmers by category of buyer for shortage of agri-input faced at K3 and reasons thereof

Shortage and input> District, category and %age in total	Faced any shortage of agri-input at K3	Not faced any shortage of agri-input at K3	Shortage of Seeds	Shortage of Chemical fertilizer	Shortage of Seeds & Chemical fertilizer	Shortage of Chemical fertilizer & Chemical pesticides	Shortage of Chemical fertilizer & Herbicide/weedicide	Reason: Seasonal Shortage	Reason: Not available in required packaging	Reason: Not available at required time
Lakhimpur	35	5	0	26	7	1	1	31	2	2
%age	87.5	12.5	0	65	17.5	2.5	2.5	77.5	5	5
K3- Exclusive Buyers	14	0	0	12	1	0	1	12	0	2
%age	35	0	0	30	2.5	0	2.5	30	0	5
K3 Buyers	21	5	0	14	6	1	0	19	2	0
% age	52.5	12.5	0	35	15	2.5	0	47.5	5	0
Barabanki	26	4	2	22	2	0	0	26	0	0
%age	86.67	13.33	6.67	73.33	6.67	0.00	0.00	86.67	0.00	0.00
K3- Exclusive Buyers	7	0	1	6	0	0	0	7	0	0
%age	23.33	0.00	3.33	20.00	0.00	0.00	0.00	23.33	0.00	0.00
K3 Buyers	19	4	1	16	2	0	0	19	0	0
%age	63.33	13.33	3.33	53.33	6.67	0.00	0.00	63.33	0.00	0.00
Total	61	9	2	48	9	1	1	57	2	2
%age	87.14	12.86	2.86	68.57	12.86	1.43	1.43	81.43	2.86	2.86
K3- Exclusive Buyers	21	0	1	18	1	0	1	19	0	2
%age	30.00	0.00	1.43	25.71	1.43	0.00	1.43	27.14	0.00	2.86
K3 Buyers	40	9	1	30	8	1	0	38	2	0
%age	57.14	12.86	1.43	42.86	11.43	1.43	0.00	54.29	2.86	0.00

There was no interlocking of markets in case of K3 as it was not into output buying or credit sales. Even Non K3 buyers did not report any compulsion to sell produce to the input/credit provider. All respondents were satisfied with qualification required to provide agricultural advice. All of them also were given receipt for their purchase from K3. But,, 85% of the farmers did not know the company behind the K3 brand of stores (tables 4.44 and 4.46). More of the non-exclusive buyers were not aware of the company behind K3 outlets.

Table 4.45: Distribution of K3 Buyer by land category for awareness about company behind K3

District and farmer category	Aware	Not aware
Lakhimpur	7	33
%age	10	47.14
Marginal Farmers	2	5
%age	2.86	7.14
Small Farmers	1	10
%age	1.43	14.29
Semi Medium Farmers	2	9
%age	2.86	12.86
Medium farmers	0	8
%age	0	11.43
Large farmers	2	1
%age	2.86	1.43
Barabanki	3	27
%age	4.29	38.57
Marginal Farmers	0	8
%age	0	11.43s
Small Farmers	3	10
%age	4.29	14.29
Semi Medium Farmers	0	6
%age	0	8.57
Medium farmers	0	3
%age	0	4.29
Large farmers	0	0
%age	0	0
Total	10	60
%age	14.29	85.71

Source: primary data

Table 4.46: Distribution of K3 Buyers by buyer category for awareness about company behind K3

Awareness> District and farmer category	Aware about the company behind K3	Not aware about the company behind K3
Lakhimpur	7	33
%age	17.5	82.5
K3- Exclusive Buyers	4	10
%age	10	25
K3 Buyers	3	23
%age	7.5	57.5
Barabanki	3	27
%age	10	90
K3- Exclusive Buyers	1	6
%age	3.33	20
K3 Buyers	2	21
%age	6.67	70
Total	10	60
%age	14.29	85.71
Total K3- Exclusive Buyers	5	16
%age	7.14	22.86
Total K3 Buyers	5	44
%age	7.14	62.86

Source: primary data

On an average, a K3 staff visited farmers 3 times in season with slightly higher visits in Lakhimpur and visits were higher in case of larger farmers in the district and for semi-medium in Barabanki (tables 4.47 and 4.48). There was no difference in K3 exclusive and non-exclusive buyers on number of visits reported though in Barabanki, the exclusive reported somewhat higher number of visits unlike Lakhimpur.

That private extension is becoming increasingly important in UP was found by Reardon et al (2011) which reported that only 18% of the farmers used extension provided by any source. Unable to find extension at right time was cited as major reason by 48% of the farmers for not using extension followed by quality of extension reported by 30% of the farmers. 24% of the farmers did not find any need for extension. Only 16% of the farmers found extension readily available. There was no much difference observed in the use of extension by the HKB users (21%) and non-users (15%). Farmers looked for general advice, new seed varieties, and information related to diseases in the extension services. High satisfaction rates of at least 75% were observed with farmers who were able to get extension services. The share of public sector in extension was 25% with the remaining 75% provided by private sector including agri-input companies like Bayer and Syngenta (17%), HKB (19%), others

like ITC (5%), and processing companies (25%). The extension services of HKB were available throughout the season but with limited outreach. Famers reported deficiency in quality of extension. Information regarding the pesticides was most sought after from extension service providers.

Table 4.47: Distribution of farmers by land category for average no. of visits by K3 staff in a crop season

No. of visits> District and type of farmer	Average No. of visits by K3 staff	No of farmers
Lakhimpur	3.25	40
Marginal Farmers	2.86	7
Small Farmers	3.09	11
Semi Medium Farmers	3.25	12
Medium farmers	3.57	7
Large farmers	4	3
Barabanki	2.97	30
Marginal Farmers	2.88	8
Small Farmers	2.46	13
Semi Medium Farmers	3.67	6
Medium farmers	4	3

Source: primary data

Table 4.48: Distribution of K3 buyers by average no. of visits by K3 staff in a crop season

No. of visits> District and type of farmer	Average No. of visits by K3 staff	Total No of farmers
Lakhimpur	3.25	40
K3- Exclusive Buyers	2.86	14
K3 Buyers	3.46	26
Barabanki	2.97	30
K3- Exclusive Buyers	3.14	7
K3 Buyers	2.91	23
Total	3.13	70
K3- Exclusive Buyers	2.95	21
K3 Buyers	3.2	49

Source: primary data

Table 4.49: Distribution of farmers by land category on perception of soil testing

Soil testing and benefit> District and type of farmer	Testing done - Yes	Testing done- No	By K3	Benefitted	Not benefitted	By Govt. Dept	Benefitted	Not benefitted
Lakhimpur	8	32	1	1	0	7	2	5
%age	11.43	45.71	1.43	1.43	0	10	2.86	7.14
Marginal Farmers	0	7	0	0	0	0	0	0
%age	0	10	0	0	0	0	0	0
Small Farmers	1	10	0	0	0	1	0	1
% age	1.43	14.29	0	0	0	1.43	0	1.43
Semi Medium Farmers	3	9	1	1	0	2	0	2
%age	4.29	12.86	1.43	1.43	0	2.86	0	2.86
Medium farmers	3	4	0	0	0	3	0	3
%age	4.29	5.71	0	0	0	4.29	0	4.29
Large farmers	1	2	0	0	0	1	0	1
% age	1.43	2.86	0	0	0	1.43	0	1.43
Barabanki	7	23	0	0	0	7	2	5
% age	10	32.86	0	0	0	10	2.86	7.14
Marginal Farmers	3	5	0	0	0	3	1	2
%age	4.29	7.14	0	0	0	4.29	1.43	2.86
Small Farmers	1	12	0	0	0	1	0	1
% age	1.43	17.14	0	0	0	1.43	0	1.43
Semi Medium Farmers	1	5	0	0	0	1	0	1
%age	1.43	7.14	0	0	0	1.43	0	1.43
Medium farmers	2	1	0	0	0	2	1	1
%age	2.86	1.43	0	0	0	2.86	1.43	1.43
Total	15	55	1	1	0	14	4	10
%age	21.43	78.57	1.43	1.43	0	20	5.71	14.29

Source: primary data

Only three farmers in Barabanki district availed of water testing. One of them was exclusive K3 buyer and semi-medium farmer who used the services of a private company for it. The other two also bought from K3 who were marginal farmers and had availed government department facility for water testing. But, they did not perceive it benefitted them. On the other hand, soil testing was more common with 18% of farmers going for it and most of them from government agency but only less than half of them found it useful (tables 4.49, 4.50 and 4.51). It was more of small landholders in both districts who went for it. It was more of non-exclusive buyers who went for soil testing. The Non-K3 buyers all used government channel for soil testing who were only as many as 17% of total like their K3 counterparts.

Table 4.50: Distribution of K3 farmers by district, type of buyer and source for soil testing

Soil testing and Source of Soil testing > District, type of farmer and % in total	Yes	No	By K3	Benefitted	Not benefitted	By Govt. Dept	Benefitted	Not benefitted
Lakhimpur	8	32	1	1	0	7	2	5
%age	20	80	2.5	2.5	0	17.5	5	12.5
Exclusive K3	2	12	0	0	0	2	1	1
%age	5	30	0	0	0	5	2.5	2.5
K3 buyers	6	20	1	1	0	5	1	4
%age	15	50	2.5	2.5	0	12.5	2.5	10
Barabanki	7	23	0	0	0	7	2	5
%age	23.33	76.67	0	0	0	23.33	6.67	16.67
Exclusive K3	0	7	0	0	0	0	0	0
%age	0	23.33	0	0	0	0	0	0
K3 buyers	7	16	0	0	0	7	2	5
%age	23.33	53.33	0	0	0	23.33	6.67	16.67
Total	15	55	1	1	0	14	4	10
%age	21.43	78.57	1.43	1.43	0	20	5.71	14.29
Exclusive K3	2	19	0	0	0	2	1	1
%age	2.86	27.14	0	0	0	2.86	1.43	1.43
K3 buyers	13	43	1	1	0	12	3	9
%age	18.57	61.43	1.43	1.43	0	17.14	4.29	12.86

Source: primary data

Table 4.51: Distribution of non-K3 farmer by district, source of soil testing and benefit

Soil testing and Source of soil testing> District, category and 5 in total	Yes	No	By Govt. Dept	Benefitted	Not benefitted
Lakhimpur	3	21	3	2	1
%age	7.14	50	7.14	4.76	2.38
Marginal Farmers	1	11	1	0	1
%age	2.38	26.19	2.38	0	2.38
Small Farmers	0	5	0	0	0
%age	0	11.90	0	0	0
Semi Medium Farmers	2	2	2	2	0
%age	4.76	4.76	4.76	4.76	0
Medium farmers	0	2	0	0	0
%age	0	4.76	0	0	0
Large farmers	0	1	0	0	0
%age	0	2.38	0	0	0
Barabanki	4	14	4	1	3
%age	9.52	33.33	9.52	2.38	7.14
Marginal Farmers	1	10	1	0	1
%age	2.38	23.81	2.38	0	2.38
Small Farmers	2	3	2	0	2
%age	4.76	7.14	4.76	0	4.76
Semi Medium Farmers	1	1	1	1	0
%age	2.38	2.38	2.38	2.38	0
Total	7	35	7	3	4
%age	16.67	83.33	16.67	7.14	9.52

Source: primary data.

Table 4.52: Distribution of K3 farmers by district, category by membership of farmer group

Membership and type> District and category of farmers	Yes	No	Co-operative Society	Average no. of meetings in a year	*Ganna Samiti*	Average no. of meetings in a year	Both	Average no. of meetings in a year
Lakhimpur	28	12	3	2.67	10	1.5	15	1.73
%age	70	30	7.50		25		37.50	
Marginal Farmers	3	4	0	0	3	1.33	0	0
% age	42.86	57.14	0		42.86		0	
Small Farmers	5	6	1	2	1	1	3	1.67
%age	45.45	54.55	9.09		9.09		27.27	
Semi Medium Farmers	10	2	1	2	4	1.5	5	1.8
%age	83.33	16.67	8.33		33.33		41.67	
Medium farmers	7	0	1	4	2	2	4	1.5
%age	100	0	14.29		28.57		57.14	
Large farmers	3	0	0	0	0	0	3	2
%age	100	0	0		0		100	
Barabanki	3	27	3	1.33	0	0	0	0
%age	10	90	10		0		0	
Marginal Farmers	2	6	2	1	0	0	0	0
%age	25	75	25		0		0	
Small Farmers	0	13	0	0	0	0	0	0
%age	0	100	0		0	0	0	
Semi Medium Farmers	1	5	1	2	0	0	0	0
%age	16.67	83.33	16.67		0		0	
Medium farmers	0	3	0	0	0	0	0	0
%age	0	100	0		0	0	0	
Total	31	39	6	2	10	1.5	15	1.73
%age	44.29	55.71	8.57		14.29		21.43	

Source: primary data

Interestingly, a large proportion of farmers reported being members of farmer collectives like PACS or sugarcane societies i.e. 45% of all and it was more the case in Lakhimpur where Sugarcane samitis are common whereas in Barabanki, it was only PACS which were used by some farmers (10%). Infact, a good proportion of farmers in Lakhimpur were members of both sugarcane samitis and PACS (tables 4.52, 4.53 and 4.54).

Table 4.53: District wise Distribution of non-k3 buyers by membership of farmer group

Membership and type> District and category of farmers	Yes	No	Co-operative Society	Average no. of meetings in a year	*Ganna Samiti*	Average no. of meetings in a year	Both	Average no. of meetings in a year
Lakhimpur	16	8	2	1	8	1.63	6	2
%age	66.67	33.33	8.33		33.33		25	
Marginal Farmers	6	6	2	1	4	1.5	0	0
%age	50	50	16.66		33.33		0	
Small Farmers	3	2	0	0	1	2	2	2.5
%age	60	40	0		20		40	
Semi Medium Farmers	4	0	0	0	2	1.5	2	2
%age	100	0	0		50		50	
Medium farmers	2	0	0	0	1	2	1	2
%age	100	0	0		50		50	
Large farmers	1	0	0	0	0	0	1	1
%age	100	0	0		0		100	
Barabanki	1	17	1	2	0	0	0	0
%age	5.56	94.44	5.56		0		0	
Marginal Farmers	0	11	0	0	0	0	0	0
%age	0	100	0		0		0	
Small Farmers	1	4	1	2	0	0	0	0
%age	20	80	20		0		0	
Semi Medium Farmers	0	2	0	0	0	0		0
%age	0	100	0		0		0	
Medium farmers	0	0	0	0	0	0	0	0
%age	0	0	0		0		0	
Total	17	25	3	1.33	8	1.63	6	2
%age	40.48	59.52	7.14		19.05		14.29	

Table 4.54: District-wise Distribution of farmers by buyer category for membership of farmer group

Membership and type> District and category	Yes	No	Co-op Society	Average no. of meetings /year	*Ganna Samiti*	Average no. of meetings/ year	Both	Average no. of meetings/ year
Lakhimpur	44	20	5	2	18	1.56	21	1.81
%age	68.75	31.25	7.81		28.13		32.81	
K3- Exclusive Buyers	6	8	0	0	5	1.4	1	2
%age	9.38	12.50	0		7.81		1.56	
K3 Buyers	22	4	3	2.67	5	1.6	14	1.71
%age	34.38	6.25	4.69		7.81		21.88	
All K3 buyers	28	12	3	2.67	10	1.5	15	1.73
%age	43.75	18.75	4.69		15.63		23.44	
Non- K3 buyers	16	8	2	1	8	1.63	6	2
%age	25	12.50	3.13		12.50		9.38	
Barabanki	4	44	4	1.5	0	0	0	0
%age	8.33	91.67	8.33		0		0	
K3 Buyers	3	27	3	1.33	0	0	0	0
%age	6.25	56.25	6.25		0		0	
All K3 buyers	3	27	3	1.33	0	0	0	0
%age	6.25	56.25	6.25		0		0	
Non- K3 buyers	1	17	1	2	0	0	0	0
%age	2.08	35.42	2.08		0		0	
Total	48	64	9	1.78	18	1.56	21	1.81
%age	42.86	57.14	8.04		16.07		18.75	

Source: primary survey

Table 4.55: District wise Distribution of K3 farmers by category for reduction in cost of production

Cost of production change and magnitude> District and category	Yes	No	Decreased upto15%	Decreased by 15-30%	Decreased by 30-45%	Decreased by >45%
Lakhimpur	6	34	4	1	1	0
%age	15	85	10	2.50	2.50	0
Marginal Farmers	2	5	1	0	1	0
%age	5	12.50	2.50	0	2.50	0
Small Farmers	1	10	0	1	0	0
%age	2.50	25	0	2.50	0	0
Semi Medium Farmers	1	11	1	0	0	0
%age	2.50	27.50	2.50	0	0	0
Medium farmers	2	5	2	0	0	0
%age	5	12.50	5	0	0	0
Large farmers	0	3	0	0	0	0
%age	0	7.50	0	0	0	0
Barabanki	6	24	3	2	0	1
%age	20	80	10	6.67	0	3.33
Marginal Farmers	1	7	1	0	0	0
%age	3.33	23.33	3.33	0	0	0
Small Farmers	3	10	1	0	0	1
%age	10	33.33	3.33	0	0	3.33
Semi Medium Farmers	1	5	1	0	0	0
%age	3.33	16.67	3.33	0	0	0
Medium farmers	1	2	0	1	0	0
%age	3.33	6.67	0	3.33	0	0
Total	12	58	7	3	1	1
%age	17.14	82.86	10	4.29	1.43	1.43

Source: primary data

Table 4.56: District wise Distribution of K3 farmers by reduction in cost of production

Cost response > district and buyer category	Yes	No	Decreased upto 15%	Decreased by 15-30%	Decreased by 30-45%	Decreased by >45%
Lakhimpur	6	34	4	1	1	0
%age	15	85	10	2.5	2.5	0
Exclusive K3	2	12	1	1	0	0
%age	5	30	2.5	2.5	0	0
K3 buyers	4	22	3	0	1	0
%age	10	55	7.5		2.5	0
Barabanki	6	24	3	2	0	1
%age	20	80	10	6.67	0	3.33
Exclusive K3	0	7	0	0	0	0
%age	0	23.33	0	0	0	0
K3 buyers	6	17	3	2	0	1
%a ge	20	56.67	10	6.67	0	3.33
Total	12	58	7	3	1	1
%age	17.14	82.86	10	4.29	1.43	1.43
Exclusive K3	2	19	1	1	0	0
%age	2.86	27.14	1.43	1.43	0	0
K3 buyers	10	39	6	2	1	1
%age	14.29	55.71	8.57	2.86	1.43	1.43

Source: primary data

Only 17% of the K3 farmers reported some decline in cost of production due to extension provided by K3 staff but it was not specific to those who bought exclusively from K3 stores. Further, in majority cases, the cost reduction was only upto 15% compared with earlier costs. Further, it was small and medium farmers who found this reduction in their costs of production and not large or marginal farmers. Of the total sample, only 10% reported the cost of production decline lower than 15% with 5% reporting it to be 15-30% cost reduction. (tables 4.55 and 4.56). Major reason for this cost reduction was proper utilisation of various resources especially in case of small farmers in Barabanki. Further, the cost reduction due to better utilisation of resources was more appreciated by non-exclusive farmers (tables 4.59 and 4.60). 1/3 of the farmers also reported receiving help from K3 staff on selection of crops with small and marginal in Lakhimpur and medium and semi-medium in Barabanki even going upto 40-60% of the total in their category (tables 4.57 and 4.58). More of non-exclusive buyers appreciated this help in crop selection than the exclusive buyers. More interesting was the farmer response on increase in yield due to K3 help which was recognised by 91% of farmers going up to 95% in Lakhimpur and more so in case of small, semi-medium and medium categories farmers across the two districts. 40% farmers each reported yield increase of upto 15% and 15-30% each and 10% even as much as more than 45% increase in their crop yields. Further, it was non-exclusive farmers who reported these yield increases in large proportions (tables 4.61-4.62). The yield increase was attributed to better seeds, better chemicals and better fertilisers and a combination of these factors in most cases (tables 4.63 and 4.64). Here again, non-exclusive buyers reported these factors much more perhaps due to the fact that they were able to compare K3 inputs with other source inputs as they were using both.

Table 4.57: District wise Distribution of K3 buyers by their perception of K3 help in crop selection

Crop and K3 help type> District and category of farmers	**Yes**	**No**	***Rabi* Crop Grown**	**Average area grown (in Acre)**	**This Season**	**Average area grown (in Acre)**	**Last Season**	**Average area grown (in Acre)**	***Kharif* Crop Grown**	**Average area grown (in Acre)**	**This Season**	**Average area grown (in Acre)**	**Last Season**	**Average area grown (in Acre)**
Lakhimpur	15	25	5	2.3	2	4	3	1.17	10	3.35	6	1.67	4	5.88
%age	37.50	62.50	12.50		5		7.50		25		15		10	
Marginal Farmers	4	3	0	0	0	0	0	0	4	1	3	1	1	1
%age	57.14	42.86	0		0		0		57.14		42.86		14.29	
Small Farmers	5	6	2	1.5	1	2	1	1	3	1.5	1	2	2	1.25
%age	45.45	54.55	18.18		9.09		9.09		27.27		9.09		18.18	
Semi Medium Farmers	2	10	2	1.25	0	0	2	1.25	0	0	0	0	0	0
%age	16.67	83.33	16.67		0		16.67		0		0		0	
Medium farmers	3	4	1	6	1	6	0	0	2	2.5	2	2.5	0	0
%age	42.86	57.14	14.29		14.29		0		28.57		28.57		0	
Large farmers	1	2	0	0	0	0	0	0	1	20	0	0	1	20
%age	33.33	66.67	0		0		0		33.33		0		0	
Barabanki	11	19	6	3.75	1	1	5	4.3	5	1.6	3	2	2	1
%age	36.67	63.33	20		3.33		16.67		16.67		10		6.67	
Marginal Farmers	1	7	1	1	0	0	1	1	0	0	0	0	0	0
%age	12.50	87.50	12.05		0		12.05		0		0		0	
Small Farmers	4	9	1	0.5	0	0	1	0.5	3	1.67	2	2	2	1
%age	30.77	69.23	7.69		0		7.69		23.08		15.38		15.38	
Semi Medium Farmers	4	2	3	2.67	1	1	2	3.5	1	1	0	0	1	0
%age	66.67	33.33	50		16.67		33.33		16.67		0		16.67	
Medium farmers	2	1	1	13	0	0	1	13	1	2	1	2	0	0
%age	66.67	33.33	33.33		0		33.33		33.33		33.33		0	
Total	26	44	11	3.09	3	3	8	3.13	15	2.77	9	1.78	6	4.25
%age	37.14	62.86	15.71		4.29		11.43		21.43		12.86		8.57	

Table 4.58: District wise Distribution of K3 buyers by category and crop for help by K3 in crop selection

Help from K3, crop and area> District, category and % in total	Yes	No	*Rabi* Crop Grown	Average area grown (in Acre)	This Season	Average area grown (in Acre)	Last Season	Average area grown (in Acre)	*Kharif* Crop Grown	Average area grown (in Acre)	This Season	Average area grown (in Acre)	Last Season	Average area grown (in Acre)
Lakhimpur	15	25	5	2.3	2	4	3	1.17	10	3.35	6	1.67	4	5.88
%age	37.50	62.50	12.50		5		7.50		25		15		10	
Exclusive K3	6	8	1	1.5	0	0	1	1.5	5	1.7	2	2.5	3	1.17
%age	15	20	2.50		0		2.50		12.50		5		7.50	
K3 buyers	9	17	4	2.5	2	4	2	1	5	5	4	1.25	1	20
% age	22.50	42.50	10		5		5		12.50		10		2.50	
Barabanki	11	19	6	3.75	1	1	5	4.3	5	1.6	3	2	2	1
%age	36.67	63.33	20		3.33		16.67		16.67		10		6.67	
Exclusive K3	3	4	2	1	0	0	2	1	1	3	1	3	0	0
%age	10	13.33	6.67		0		6.67		3.33		3.33		0	
K3 buyers	8	15	4	5.12	1	1	3	6.5	4	1.25	2	1.5	2	1
%age	26.67	50	13.33		3.33		13.33		13.33		6.67		6.67	
Total	26	44	11	3.09	3	3	8	3.13	15	2.77	9	1.78	6	4.25
%age	37.14	62.86	15.71		4.29		11.43		21.43		12.86		8.57	

Table 4.59: Distribution of K3 farmer by category for perception on reduction in cost of production and reasons thereof

Perception on cost of production change and reason> District and category of farmers	Yes	No	Proper utilisation of resources	Better seeds, Better Chemicals & Better fertilizers	Better seeds, Better Chemicals, Better fertilizers, New techniques, Proper utilisation of resources	Better seeds, Better Chemicals & Proper utilisation of resources	New techniques & Proper utilisation of resources
Lakhimpur	6	34	4	1	1	0	0
%age	15	85	10	2.50	2.50	0	0
Marginal Farmers	2	5	1	1	0	0	0
%age	5	12.50	2.50	2.50	0	0	0
Small Farmers	1	10	1	0	0	0	0
%age	2.50	25	2.50	0	0	0	0
Semi Medium Farmers	1	11	1	0	0	0	0
%age	2.50	27.50	2.50	0	0	0	0
Medium farmers	2	5	1	0	1	0	0
%age	5	12.50	2.50	0	2.50	0	0
Large farmers	0	3	0	0	0	0	0
%age	0	7.50	0	0	0	0	0
Barabanki	6	24	4	0	0	1	1
%age	20	80	13.33	0	0	3.33	3.33
Marginal Farmers	1	7	1	0	0	0	0
%age	333	23.33	3.33	0	0	0	0
Small Farmers	3	10	2	0	0	1	0
%age	10	33.33	6.67	0	0	3.33	0
Semi Medium Farmers	1	5	0	0	0	0	1
%age	3.33	16.67	0	0	0	0	3.33
Medium farmers	1	2	1	0	0	0	0
%age	3.33	6.67	3.33	0	0	0	0
Total	12	58	8	1	1	1	1
% Age	17.14	82.86	11.43	1.43	1.43	1.43	1.43

Source: primary data

Table 4.60: Distribution of farmers by buyer category and reasons for reduction in cost of production

Cost response and reason> District and type of buyer	Yes	No	Proper utilisation of resources	Better seeds, Better Chemicals & Better fertilizers	Better seeds, Better Chemicals, Better fertilizers, New techniques, Proper utilisation of resources	Better seeds, Better Chemicals & Proper utilisation of resources	New techniques & Proper utilisation of resources
Lakhimpur	6	34	4	1	1	0	0
%age	15	85	10	2.5	2.5	0	0
Exclusive K3	2	12	2	0	0	0	0
%age	5	30	5	0	0	0	0
K3 buyers	4	22	2	1	1	0	0
%age	10	55	5	2.5	2.5	0	0
Barabanki	6	24	4	0	0	1	1
%age	20	80	13.33	0	0	3.33	3.33
Exclusive K3	0	7	0	0	0	0	0
%age	0	23.33	0	0	0	0	0
K3 buyers	6	17	4	0	0	1	1
%age	20	56.67	13.33	0	0	3.33	3.33
Total	12	58	8	1	1	1	1
%age	17.14	82.86	11.43	1.43	1.43	1.43	1.43
Exclusive K3	2	19	2	0	0	0	0
%age	2.86	27.14	2.86	0	0	0	0
K3 buyers	10	39	6	1	1	1	1
%age	14.29	55.71	8.57	1.43	1.43	1.43	1.43

Source: primary data

Table 4.61: Distribution of K3 farmers by land category for their perception of increase in yield

Perception of yield change and magnitude> District and category of farmers	Yes	No	Increased by 0-15%	Increased by 15-30%	Increased by 30-45%	Increased by >45%
Lakhimpur	38	2	19	17	0	2
%age	95	5	47.50	42.50	0	5
Marginal Farmers	6	1	3	3	0	0
%age	85.71	14.29	42.86	42.86	0	0
Small Farmers	11	0	3	7	0	1
%age	100	0	27.20	63.64	0	9.09
Semi Medium Farmers	12	0	7	4	0	1
%age	100	0	58.33	33.33	0	8.33
Medium farmers	7	0	4	3	0	0
%age	100	0	57.14	42.86	0	0
Large farmers	2	1	2	0	0	0
%age	66.67	33.33	66.67	0	0	0
Barabanki	26	4	9	11	1	5
%age	86.67	13.33	30	36.67	3.33	16.67
Marginal Farmers	6	2	4	2	0	0
%age	75	25	50	25	0	0
Small Farmers	11	2	2	5	1	3
%age	84.62	15.38	15.38	38.46	7.69	23.08
Semi Medium Farmers	6	0	1	4	0	1
%age	100	0	16.67	66.67	0	16.67
Medium farmers	3	0	2	0	0	1
%age	100	0	66.67	0	0	33.33
Total	64	6	28	28	1	7
%age	91.43	8.57	40	40	1.43	10

Source: primary data

Table 4.62: Distribution of K3 buyers by category for perception of increase in yield and magnitude

Yield response and yield increase by> District and type of buyer	Yes	No	0-15%	15-30%	30-45%	> 45%
Lakhimpur	38	2	19	17	0	2
%age	95	5	47.5	42.5	0	5
Exclusive K3	13	1	5	8	0	0
%age	32.5	2.5	12.5	20	0	0
K3 buyers	25	1	14	9	0	2
%age	62.5	2.5	35	22.5	0	5
Barabanki	26	4	9	11	1	5
%age	86.67	13.33	30	36.67	3.33	16.67
Exclusive K3	6	1	2	3	0	1
%age	20	3.33	6.67	10	0	3.33
K3 buyers	20	3	7	8	1	4
%age	66.67	10	23.33	26.67	3.33	13.33
Total	64	6	28	28	1	7
%age	91.43	8.57	40	40	1.43	10
Exclusive K3	19	2	7	11	0	1
%age	27.14	2.86	10	15.71	0	1.43
K3 buyers	45	4	21	17	1	6
%age	64.29	5.71	30	24.29	1.43	8.57

Source: primary data

Table 4.63: Distribution of K3 farmers by land category for perception on yield increase and reasons thereof

Yield response and reasons> Districts and farmer category	Yes	No	Better seeds	Better Chemicals	New techniques	Better seeds & Better Chemicals	Better seeds, Better Chemicals & better Fertilizers	Better seeds, Better Chemicals, better Fertilizers & New techniques	Better seeds, Better Chemicals & Proper utilisation of resources	Better seeds & better Fertilizers	Better seeds, better Fertilizers & New techniques	Better seeds & New techniques
Lakhimpur	38	2	11	1	0	8	9	0	1	7	0	1
%age	95	5	27.5	2.5	0	20	22.5	0	2.5	17.5	0	2.5
Marginal Farmers	6	1	2	0	0	2	0	0	0	2	0	0
%age	15	2.5	5	0	0	5	0	0	0	5	0	0
Small Farmers	11	0	1	0	0	3	3	0	1	3	0	0
%age	27.5	0	2.5	0	0	7.5	7.5	0	2.5	7.5	0	0
Semi Medium Farmers	12	0	5	1	0	0	3	0	0	2	0	1
%age	30	0	12.5	2.5	0	0	7.5	0	0	5	0	2.5
Medium farmers	7	0	2	0	0	2	3	0	0	0	0	0
%age	17.5	0	5	0	0	5	7.5	0	0	0	0	0
Large farmers	2	1	1	0	0	1	0	0	0	0	0	0
%age	5	2.5	2.5	0	0	2.5	0	0	0	0	0	0
Barabanki	26	4	12	0	1	3	2	1	0	5	1	1
%age	86.67	13.33	40	0	3.33	10	6.67	3.33	0	16.67	3.33	3.33
Marginal Farmers	6	2	3	0	0	1	0	0	0	2	0	0
%age	20	6.67	10	0	0	3.33	0	0	0	6.67	0	0
Small Farmers	11	2	5	0	1	2	2	0	0	1	0	0
%age	36.67	6.67	16.67	0	3.33	6.67	6.67	0	0	3.33	0	0
Semi Medium Farmers	6	0	1	0	0	0	0	1	0	2	1	1
%age	20	0	3.33	0	0	0	0	3.33	0	6.67	3.33	3.33
Medium farmers	3	0	3	0	0	0	0	0	0	0	0	0
%age	10	0	10	0	0	0	0	0	0	0	0	0
Total	64	6	23	1	1	11	11	1	1	12	1	2
%age	91.43	8.57	32.86	1.43	1.43	15.71	15.71	1.43	1.43	17.14	1.43	2.86
Marginal Farmers	12	3	5	0	0	3	0	0	0	4	0	0
%age	17.14	4.29	7.14	0	0	4.29	0	0	0	5.71	0	0
Small Farmers	22	2	6	0	1	5	5	0	1	4	0	0
%age	31.43	2.86	8.57	0	1.43	7.14	7.14	0	1.43	5.71	0	0
Semi Medium Farmers	18	0	6	1	0	0	3	1	0	4	1	2
%age	25.71	0	8.57	1.43	0	0	4.29	1.43	0	5.71	1.43	2.86
Medium farmers	10	0	5	0	0	2	3	0	0	0	0	0
%age	14.29	0	7.14	0	0	2.86	4.29	0	0	0	0	0
Large farmers	2	1	1	0	0	1	0	0	0	0	0	0
%age	2.86	1.43	1.43	0	0	1.43	0	0	0	0	0	0

Table 4.64: Distribution of K3 farmers by buyer type for increase in yield and reasons thereof

Yield response and reasons> / District and buyer farmer type	Yes	No	Better seeds	Better Chemicals	New techniques	Better seeds & Better Chemicals	Better seeds, Better Chemicals & better Fertilizers	Better seeds, Better Chemicals, better Fertilizers & New techniques	Better seeds, Better Chemicals & Proper utilisation of resources	Better seeds & better Fertilizers	Better seeds, better Fertilizers & New techniques	Better seeds & New techniques
Lakhimpur	38	2	11	1	0	8	9	0	1	7	0	1
%age	95	5	27.5	2.5	0	20	22.5	0	2.5	17.5	0	2.5
Exclusive K3	13	1	3	0	0	4	3	0	0	2	0	1
%age	32.5	2.5	7.5	0	0	10	7.5	0	0	5	0	2.5
K3 buyers	25	1	8	1	0	4	6	0	1	5	0	0
%age	62.5	2.5	20	2.5	0	10	15	0	2.5	12.5	0	0
Barabanki	26	4	12	0	1	3	2	1	0	5	1	1
%age	86.67	13.33	40	0	3.33	10	6.67	3.33	0	16.67	3.33	3.33
Exclusive K3	6	1	2	0	0	1	1	1	0	1	0	0
%age	20	3.33	6.67	0	0	3.33	3.33	3.33	0	3.33	0	0
K3 buyers	20	3	10	0	1	2	1	0	0	4	1	1
%age	66.67	10	33.33	0	3.33	6.67	3.33	0	0	13.33	3.33	3.33
Total	64	6	23	1	1	11	11	1	1	12	1	2
%age	91.43	8.57	32.86	1.43	1.43	15.71	15.71	1.43	1.43	17.14	1.43	2.86
Exclusive K3	19	2	5	0	0	5	4	1	0	3	0	1
%age	27.14	2.86	7.14	0	0	7.14	5.71	1.43	0	4.29	0	1.43
K3 buyers	45	4	18	1	1	6	7	0	1	9	1	1
%age	64.29	5.71	25.71	1.43	1.43	8.57	10	0	1.43	12.86	1.43	1.43

4.4 Summary

The foregoing analysis of the K3 supermarket outlets shows that K3 buyers were smaller farmers in general than their non-buying counterparts especially those who exclusively bought from K3. But, on an average, K3 buyers (exclusive) leased in much higher land on an average both in Lakhimpur and Barabanki than their non-K3 counterparts. The average operated land size of K3 non-exclusive buyers in Lakhimpur was as high as 11 acres while of those who bought exclusively, it was only 6 acres.

In general, K3 exclusive buyers were less likely to own tractors compared with their K 3 buyers counterparts and non-K3 buyers in both the districts but Barabanki in general had lower ownership of tractors across all categories compared with those in Lakhimpur. This was also due the fact that land holdings in Barabanki were much smaller than those in Lakhimpur. Of all, only 50% of farmers owned a tractor. Further, more of small and marginal farmers had tractors in Barabanki than in Lakhimpur.

Mostly, medium category farmers were aged with average age being 51 years. On the other hand, among non- K3 buyers, it was marginal and small farmers who were older in age on average, especially those in Barabanki than their other counterparts. The Barabanki farmers had higher levels of literacy including in K3 exclusive category and in general there were relatively few graduate and post-graduate farmers and they (graduates and PGs) were mostly in non-buyer or non-exclusive buyer category so far as K3 was concerned.

In cropping pattern, there were clear differences across districts and sets of farmers. Sugarcane was mainly in Lakhimpur and accounted for 23% of GCA with K3 exclusive byers putting as much as 50% area under it and other K3 farmers only 19%, thus altogether 25% of K3 buyer farmer area being under sugarcane. Compared with this, non-k3 buyers had only 20% area under the crop. Further, in Barabanki, it was a small time crop with only 1% area under it and that too mainly in case of non-K3 buyers who had 4% area under it. The K3 categories did not go for it at all. Overall, 15% of all surveyed farmer GCA was under sugarcane and average was 3.84 acres with those in Lakhimpur having 3.96 acres on an average. In *Kharif*, major crop was paddy across both districts with share of 33% and 36% of GCA in Lakhimpur and

Barabanki and 34% of area across districts followed by wheat in *rabi* which was equally important with 33% and 24% of GCA in Lakhimpur and Barabanki, the overall share of wheat in GCA being 30%. The next major crop was paddy in *zaid* season only in Lakhimpur with 7% of GCA grown only by a few large farmers in one set of villages. The other crops were *mentha* (mint) and mustard in that order with 7% and 4% of GCA across the two districts with mentha being grown only in Barabanki with 21% of GCA in the district and mustard in 11% of GCA in the district. Further, it was exclusive buyers of K3 who grew relatively less paddy, maize and wheat and more of pulses, mustard, menthe, potato and vegetables across both the districts as %age of GCA, which are all high value crops. They were also more into sugarcane compared with their other counterparts in Lakhimpur.

In general, Barabanki had higher cropping intensity than Lakhimpur and further marginal farmers in Lakhimpur had higher cropping intensity than other categories except large ones and in Barabanki it was not very different across categories. K3 exclusive buyers were less intensive than others and in Barabanki they were the most intensive cultivators of their land.

It was mostly paddy seed and wheat seed which were bought from the market by all types of farmers and there were no differences across categories or districts. Similarly, all farmers used chemical fertilisers except one in Barabanki. Micro nutrient use was higher among K3 buyers than by non-buyers and lower for *zaid* crops in Barabanki. PGPs were mostly used in *rabi* and *zaid* crops and not much in sugarcane or *Kharif* paddy across categories and districts. Very few farmers bought sugarcane seed while every farmer bought wheat and paddy seed irrespective of farm size category. Chemical pesticides were widely used across crops and seasons and farmer categories except in *rabi* where one-third farmers did not use them. Non-K3 buyers especially in Barabanki used much less pesticides. Weedicides were more commonly used in *Kharif* paddy crops and *zaid* paddy. Fungicides were more common among K3 farmers than among non-K3 farmers but only 1/3 to 50% of farmers across crops and categories used it. It was much less used in sugarcane and wheat. Micronutrients were used more by large and medium farmers in Lakhimpur as well as in Barabanki in wheat and paddy but in sugarcane in Lakhimpur, it was smaller farmers who bought less of micro-nutrients. PGPs were used more in *rabi* (wheat) and *zaid* crops and very few

farmers used it in sugarcane and paddy. Only two farmers bought biofertilisers and in Barabanki, none bought biopesticides and even in Lakhimpur, it was 5% of farmers who bought it and all of them were K3 buyers wholly or partly. No non-K3 buyer bought any biopesticides.

In general, more of non-K3 farmers bought inputs on cash and more of Barabanki farmers bought them on cash and within the district, it was smaller holders who paid in cash more often. On the other hand, K3 farmers in both districts largely bought it on cash. Most of the K3 farmers bought inputs on cash (83%) across categories and districts. In terms of quality and effectiveness of service by K3 outlets, the shortage of inputs was reported mainly by small, marginal and semi-medium farmers in both the districts with 87% farmers reporting it and mainly in chemical fertilisers and to some extent in seed. The major dimension reported was shortage in season. Even in each district, the picture was similar though farmers also reported a combination of inputs for shortage and multiple dimensions for shortage. Further, a higher proportion of non-exclusive buyers reported shortage at K3 outlets though it was mainly seasonal shortage and mainly of fertilisers and seeds to some extent.

There was no interlocking of markets in case of K3 as it was not into output buying or credit sales. Even Non K3 buyers did not report any compulsion to sell produce to the input/credit provider. All respondents were satisfied with qualification required to provide agricultural advice. All of them also were given receipt for their purchase from K3. But,, 85% of the farmers did not know the company behind the K3 brand of stores. More of the non-exclusive buyers were not aware of the company behind K3 outlets.

Only three farmers went in for water testing in Barabanki district and one of them was exclusive K3 buyer and semi-medium farmer who used the services of a private company for it. On the other hand, soil testing was more common with 18% of farmers going for it and most of them from government agency but only less than half of them found it useful. It was more of small landholders in both districts who went for it. It was more of non-exclusive buyers who went for soil testing. The Non-K3 buyers all used government channel for soil testing who were only as many as 17% of total like their k3 counterparts.

Interestingly, a large proportion of farmers reported being members of farmer collectives like PACS or sugarcane societies i.e. 45% of all and it was more the case in Lakhimpur where Sugarcane samitis are common whereas in Barabanki, it was only PACS, which were used by some farmers (10%). Infact, a good proportion of farmers in Lakhimpur were members of both sugarcane samitis and PACS.

Only 17% of the K3 farmers reported some decline in cost of production due to extension provided by K3 staff but it was not specific to those who bought exclusively from K3 stores. Further, in majority cases, the cost reduction was only upto 15% compared with earlier costs. Further, it was small and medium farmers who found this reduction in their costs of production and not large or marginal farmers. Of the total sample, only 10% reported the cost of production decline lower than 15% with 5% reporting it to be 15-30% cost reduction. Major reason for this cost reduction was proper utilisation of various resources especially in case of small farmers in Barabanki. Further, the cost reduction due to better utilisation of resources was more appreciated by non-exclusive farmers. 1/3 of the farmers also reported receiving help from K3 staff on selection of crops with small and marginal in Lakhimpur and medium and semi-medium in Barabanki even going upto 40-60% of the total in their category. More of non-exclusive buyers appreciated this help in crop selection than the exclusive buyers. More interesting was the farmer response on increase in yield due to K3 help which was recognised by 91% of farmers going up to 95% in Lakhimpur and more so in case of small, semi-medium and medium categories farmers across the two districts. 40% farmers each reported yield increase of upto 15% and 15-30% each and 10% even as much as more than 45% increase in their crop yields. Further, it was non-exclusive farmers who reported these yield increases in large proportions. The yield increase was attributed to better seeds, better chemicals and better fertilisers and a combination of these factors in most cases. Here again, non-exclusive buyers reported these factors much more perhaps due to the fact that they were able to compare K3 inputs with other source inputs as they were using both.

Thus, we can say that the K3 outlets were inclusive of small farmers and were more inclusive than traditional channels and helped farmers achieve higher yield, lower costs of production and better resource management though they were still plagued by

shortage of fertilisers as there is government allocation of fertilisers every season. But, still the K3 stores need to do better to get more loyalty, which was limited only to a small percentage of buyers right now. This could be partly due to implicit interlinking of credit and input markets and partly due to lack of output linkage with farmers which take them to other channels.

Appendix 4.1

Table 1: List of all Khushali Krishi Kendras (KKKs) by year of opening

S no.	Center	Date/year	District	Total
2004				**1**
1	Karanpur[#]	23-11-2004	Lakhimpur	
2005				**4**
2	Biswa*	16-05-2005	Sitapur	
3	Bhanmau*	16-09-2005	Barabanki	
4	Mechretta*	18-11-2005	Sitapur	
5	Mau[#]	29-11-2005	Gonda	
2006				**18**
6	Zaffarpur*	07-02-2006	Barabanki	
7	Baddupur*	17-02-2006	Barabanki	
8	Kumarganj*	21-04-2006	Faizabad	
9	Bhadura	01-05-2006	Lakhimpur	
10	Mahsi*	09-06-2006	Bahraich	
11	Satrik*	27-06-2006	Barabanki	
12	Deviganj[#]	30-06-2006	Barabanki	
13	Longapur[#]	14-07-2006	Sahajahanpur	
14	Puranpur[#]	14-07-2006	Pilibhit	
15	Ram nagar[#]	25-07-2006	Barabanki	
16	Nakha pipri[#]	28-09-2006	Lakhimpur	
17	Gonda mandi[$]	28-09-2006	Gonda	
18	Amaniganj*	03-10-2006	Faizabad	
19	Tiloi[#]	07-11-2006	C.g.s.m. nagar	
20	Kamlapur*	08-11-2006	Sitapur	
21	Oel[#]	17-11-2006	Lakhimpur	
22	Kotwa sarak[#]	12-12-2006	Barabanki	
23	Tulsipur[#]	22-12-2006	Balrampur	
2007				**16**
24	Shankerganj[#]	12-01-2007	C.g.s.m. nagar	
25	Karthala*	18-02-2007	Etah	
26	Aliganj[#]	22-02-2007	Lakhimpur	
27	Hydargarh[#]	25-04-2007	Barabanki	
28	Ambetha*	27-04-2007	Saharanpur	
29	Inhouna[#]	27-04-2007	C.g.s.m. nagar	
30	Jogipura[#]	08-05-2007	J.p.nagar	
31	Maharajganj[#]	26-06-2007	Raibareily	
32	Utroula[#]	28-08-2007	Balrampur	
33	Rajabpur[#]	25-09-2007	J.p.nagar	
34	Jagatpur[#]	25-09-2007	Raibareily	
35	Uchahar*	25-09-2007	Raibareily	
36	Bacharawa[#]	16-10-2007	Raibareily	
37	Gosaiganj[#]	30-11-2007	Lucknow	
38	Shivgarh[#]	30-12-2007	Raibareily	
39	Gaura[#]	30-12-2007	Raibareily	

2008				**12**
40	Bababazar[#]	04-01-2008	Faizabad	
41	Maharuva bazar*	19-02-2008	Ambedkarnagar	
42	Bairampur barva*	19-02-2008	Ambedkarnagar	
43	Raja bazar[#]	25-02-2008	Janupur	
44	Khutar[#]	29-02-2008	Sahajahanpur	
45	Gajroula[#]	30-05-2008	J.p.nagar	
46	Amarsanda*	08-08-2008	Barabanki	
47	Mishrikh*	08-08-2008	Sitapur	
48	Chuchelakalan[#]	09-09-2008	J.p.nagar	
49	Dhumri[#]	12-09-2008	Etah	
50	Katghar[#]	07-11-2008	Raibareily	
51	Kasta*	21-11-2008	Lakhimpur	
2009				**2**
52	Devbandh*	23-03-2009	Saharanpur	
53	Amroha[#]	13-11-2009	J.P.nagar	
2010				**6**
54	Hardoi mandi[$]	16-04-2010	Hardoi	
55	Sultanput mandi[$]	25-05-2010	Sultanpur	
56	Bahraich mandi[$]	25-05-2010	Bahraich	
57	Amroha mandi[$]	20-09-2010	J.p.nagar	
58	Rampur mandi[$]	20-09-2010	Rampur	
59	Sameshi[#]	12-11-2010	Lucknow	
2011				**4**
60	Faizabad mandi[$]	04-01-2011	Faizabad	
61	Pratapgarh mandi[$]	01-02-2011	Pratapgarh	
62	Aligarh mandi[$]	04-10-2011	Aligarh	
63	Maigalganj mandi[$]	04-11-2011	Lakhimpur	
2012				**5**
64	Nanpara mandi[$]	08-02-2012	Bahraich	
65	Parixitgarh mandi[$]	12-03-2012	Meerut	
66	Bisli mandi[$]	13-04-2012	Badaun	
67	Dataganj mandi[$]	06-07-2012	Badaun	
68	Mohammdi mandi[$]	27-11-2012	Lakhimpur	
2013				**11**
69	Safdarganj mandi[$]	14-01-2013	Barabanki	
70	Colonelganj mandi[$]	29-01-2013	Gonda	
71	Risia mandi[$]	09-02-2013	Bahraich	
72	Hasanpur mandi[$]	15-02-2013	J.p.nagar	
73	Madhoganj mandi[$]	30-07-2013	Hardoi	
74	Sandi mandi[$]	27-08-2013	Hardoi	
75	Kannauj mandi[$]	27-08-2013	Kannauj	
76	Lalganj mandi[$]	06-09-2013	Raibareily	
77	Sahjnwa mandi[$]	09-11-2013	Gorakpur	
78	Murga badsahpur[$]	11-11-2013	Jaunpur	
79	Mainpuri mandi[$]	2013	Mainpuri	

Note: * leased in from HPCL ; [#] leased in from Rajas ; [$] leased in from *Mandi Parishad*

Table 2: Distribution of farmers by Category and Religion

Category	K3 Buyers				Non-K3 Buyers			
Religion District and category	Hindu	Sikh	Muslim	Total	Hindu	Sikh	Muslim	Total
Lakhimpur	34	4	2	40	21	3	0	24
%age	85	10	5	100	87.5	12.5	0	100
Marginal Farmers	7	0	0	7	12	0	0	12
%age	100	0	0	100	100	0	0	100
Small Farmers	10	0	1	11	5	0	0	5
%age	90.91	0	9.09	100	100	0	0	100
Semi Medium Farmers	12	0	0	12	2	2	0	4
%age	100	0	0	100	50	50	0	100
Medium farmers	5	1	1	7	2	0	0	2
%age	71.42	14.29	14.29	100	100	0	0	100
Large farmers	0	3	0	3	0	1	0	1
%age	0	100	0	100	0	100	0	100
Barabanki	30	0	0	30	18	0	0	18
%age	100	0	0	100	100	0	0	100
Marginal Farmers	8	0	0	8	11	0	0	11
%age	100	0	0	100	100	0	0	100
Small Farmers	13	0	0	13	5	0	0	5
%age	100	0	0	100	100	0	0	100
Semi Medium Farmers	6	0	0	6	2	0	0	2
%age	100			100	100	0	0	100
Medium farmers	3	0	0	3	0	0	0	0
%age	100	0	0	0	0	0	0	0
Total	64	4	2	70	39	3	0	42
%age	91.43	5.71	2.86	100	92.86	7.14	0	100
Marginal Farmers	15	0	0	15	23	0	0	23
%age	100	0	0	100	100	0	0	100
Small Farmers	23	0	1	24	10	0	0	10
%age	95.83	0	4.17	100	100	0	0	100
Semi Medium Farmers	18	0	0	18	4	2	0	6
%age	100	0	0	100	66.67	33.33	0	100
Medium farmers	8	1	1	10	2	0	0	2
%age	80	10	10	100	100	0	0	100
Large farmers	0	3	0	3	0	1	0	1
%age	0	100	0	100	0	100	0	100

Source: primary data

Table 3: Distribution of K3 Buyers by Caste

Caste> District and farmer category	OBC					General			SC			Total
Sub- Caste >	***Kurmi***	***Gupta***	***Kashyap***	***Yadav***	***Maurya***	***Brahman***	***Jat***	***Thakur***	***Pasi***	***Pathan***	***Rajput***	
Lakhimpur	12	1	1	2	0	4	4	7	7	2	0	40
%age	30	2.5	2.5	5	0	10	10	17.5	17.5	5	0	100
Marginal Farmers	3	0	0	0	0	1	0	2	1	0	0	7
%age	42.85	0	0	0	0	14.29	0	28.57	14.29	0	0	
Small Farmers	1	0	0	2	0	2	0	4	1	1	0	11
%age	9.09	0	0	18.18	0	18.18	0	36.36	9.09	9.09	0	100
Semi Medium Farmers	6	0	0	0	0	1	0	1	4	0	0	12
%age	50	0	0	0	0	8.33	0	8.33	33.33	0	0	100
Medium farmers	2	1	1	0	0	0	1	0	1	1	0	7
% age	28.57	14.29	14.29	0	0	0	14.29	0	14.29	14.29	0	100
Large farmers	0	0	0	0	0	0	3	0	0	0	0	3
%age	0	0	0	0	0	0	100	0	0	0	0	100
Barabanki	17	0	0	0	1	5	0	4	0	0	3	30
%age	56.67	0	0	0	3.33	16.67	0	13.33	0	0	10	100
Marginal Farmers	3	0	0	0	0	1	0	1	0	0	3	8
%age	37.5	0	0	0	0	12.5	0	12.5	0	0	37.5	100
Small Farmers	8	0	0	0	1	2	0	2	0	0	0	13
%age	61.54	0	0	0	7.69	15.38	0	15.38	0	0	0	100
Semi Medium Farmers	4	0	0	0	0	2	0	0	0	0	0	6
%age	66.67	0	0	0	0	33.33	0	0	0	0	0	100
Medium farmers	2	0	0	0	0	0	0	1	0	0	0	3
%age	66.67	0	0	0	0		0	33.33	0	0	0	100
Total	29	1	1	2	1	9	4	11	7	2	3	70
%age	41.43	1.43	1.43	2.86	1.43	12.86	5.71	15.71	10	2.86	4.29	100
Marginal Farmers	6	0	0	0	0	2	0	3	1	0	3	15
%age	40	0	0	0	0	13.33	0	20	6.67	0	20	100
Small Farmers	9	0	0	2	1	4	0	6	1	1	0	24
%age	37.5	0	0	8.33	4.17	16.67	0	25	4.17	4.17	0	100
Semi Medium Farmers	10	0	0	0	0	3	0	1	4	0	0	18
%age	55.56	0	0	0	0	16.67	0	5.56	22.22	0	0	100
Medium farmers	4	1	1	0	0	0	1	1	1	1	0	10
%age	40	10	10	0	0	0	10	10	10	10	0	100
Large farmers	0	0	0	0	0	0	3	0	0	0	0	3
%age	0	0	0	0	0	0	100	0	0	0	0	100

Table 4: Distribution of Non-K3 Buyers by Caste

Caste> District and farmer category	**OBC**					**General**		**SC**		**Total**
Sub-Caste >	***Kurmi***	***Gupta***	***Lodha***	***Yadav***	***Maurya***	***Jatt***	***Thakur***	***Pasi***	***Rajput***	
Lakhimpur	2	1	4	3	0	3	3	7	1	24
%age	8.33	4.17	16.67	12.5	0	12.5	12.5	29.17	4.17	100
Marginal Farmers	1	0	2	0	0	0	2	6	1	12
%age	8.33	0	16.67	0	0	0	16.67	50	8.33	100
Small Farmers	1	0	2	1	0	0	0	1	0	5
%age	20	0	40	20	0	0	0	20	0	100
Semi Medium Farmers	0	0	0	1	0	2	0	0	0	3
%age	0	0	0	33.33	0	66.67	0	0	0	100
Medium farmers	0	1	0	1	0	0	1	0	0	3
%age	0	33.33	0	33.33	0	0	33.33	0	0	100
Large farmers	0	0	0	0	0	1	0	0	0	1
%age	0	0	0	0	0	100	0	0	0	100
Barabanki	2	0	0	8	1	0	3	4	0	18
%age	11.11	0	0	44.44	5.56	0	16.67	22.22	0	100
Marginal Farmers	2	0	0	3	0	0	3	3	0	11
%age	18.18	0	0	27.27	0	0	27.27	27.27	0	100
Small Farmers	0	0	0	3	1	0	0	1	0	5
%age	0	0	0	60	20	0	0	20	0	100
Semi Medium Farmers	0	0	0	2	0	0	0	0	0	2
%age	0	0	0	100	0	0	0	0	0	100
Medium farmers	0	0	0	0	0	0	0	0	0	0
%age	0	0	0	0	0	0	0	0	0	0
Total	4	1	4	11	1	3	6	11	1	42
%age	9.52	2.38	9.52	26.19	2.38	7.14	14.29	26.19	2.38	100
Marginal Farmers	3	0	2	3	0	0	5	9	1	23
%age	13.04	0	8.7	13.04	0	0	21.74	39.13	4.35	100
Small Farmers	1	0	2	4	1	0	0	2	0	10
%age	10	0	20	40	10	0	0	20	0	100
Semi Medium Farmers	0	0	0	3	0	2	0	0	0	5
%age	0	0	0	60	0	40	0	0	0	100
Medium farmers	0	1	0	1	0	0	1	0	0	3
%age	0	33.33	0	33.33	0	0	33.33	0	0	100
Large farmers	0	0	0	0	0	1	0	0	0	1
%age	0	0	0	0	0	100	0	0	0	100

Chapter 5

Agri-franchising and Agri-input markets in Bihar

5.1. Rationale for agribusiness franchising

Contract Farming has been studied as an institutional innovation in agribusiness (Vande and Maertens, 2014), but not agri-franchising though it is also an innovation in the field of franchising and agribusiness (Stankovic, 2014). Agribusiness or agricultural franchising is quite new globally as well as in India, though it is quite commonly used in other businesses like fast food, hotel and other service industries where service quality is crucial to maintain brand equity. Major examples in food sector include: Subway, KFC, and Sankalp and Jumbo King. Franchising accounted for a significant percentage of GDP as well as employment in some countries like Australia, USA and Brazil ranging from 4-10% of GDP and 2-6% of employment in 2012. In India, it is still less than 2% of GDP and less than 1% of employment (KMPG and FAI, 2013). Franchising has emerged as an important alternative to other modes of market entry and presence like conventional distribution and own stores in farm supply sector as it helps scale compared with mainstream conventional distribution system and is lower cost compared with own or COCO stores (table 1). As against COCO model, franchising offers low investment risk for franchisee, low incentive for free riding for both, low firm specific assets investment, higher level of repeat business and for the franchisee, it offers capital for expansion, and better management by franchisee than employees (Hatten 1997; Brickley and Dark, 2003). Franchising helps franchisors spread faster in markets, achieve higher turnover, establish brand presence and leverage local resources and skills for growth of the brand without taking all the risk on their own. On the franchisee side, the advantages of franchising include access to credit, technology, market, marketing and higher turnover (Fosu, 1989).

There are only a few studies in other contexts (Africa and Asia) which examine the performance of franchising in sub-sectors of agribusiness i.e. cattle feed (Fosu, 1989; McKague and Siddiquee, 2014) or a documented case of experience of designing and delivering a franchise system for hydroponic greenhouse business (Walliser, 2011).

Franchising is a continuous relationship (long term partnership) in which a franchiser provides a licensed privilege to the franchisee to conduct business in addition to providing assistance in organising, training, and merchandizing. In return, the franchiser receives a certain amount from the franchisee as initial fee and sometimes also royalty on business volumes conducted. It can be product, business format or trade name franchise. The basic ingredients of a franchise system are: obligations of both the parties, initial/later/ongoing fees and mode of payment, identified/specified territory, specified duration, termination of agreement procedures, post termination confidentiality, and procedure of arbitration (Fosu, 1989; Hoy and Stanworth, 2003). An agribusiness franchise can be defined as "a right, permission, or license (often established by contract) granted by an agribusiness firm (called the franchisor or franchising company) to another agribusiness firm (called the franchisee) for the latter to distribute, manufacture, and/or use the trade name of the former's products and services usually in a specified territory assigned to the latter firm by the former firm" (Fosu, 1989, p.96).

Table 5.1: A comparative view of franchising as a channel

Distribution/access channel> parameter	**Conventional distribution**	**COCO**	**Franchising**
Cost/investment	low	high	Medium
Scale up	fast	slow	fast
Quality control	low	high	medium
Last mile reach	low	low	high
Ease of undoing	low	high	medium
Market risk	low	high	high
Free riding	medium	low	high
Shirking	low	high	low
Quasi rent appropriation	medium	low	high

Source: developed by author.

A franchise is an on-going business relationship that includes not only the product, service, and trade mark, but the entire business format itself - marketing strategy and plan, operating manuals, quality control, and continuing two-way communication (Brickley and Dark, 2003). Alternately, it is a continuous relationship in which a

franchiser provides a licensed privilege to conduct business in addition to providing assistance in organising, training and merchandizing. In return, the franchiser receives a certain amount from the franchisee. It is a contractual relationship under which the franchiser gives right/permission to the franchisee/s to distribute, manufacture, and/or use the trade name/patent, of its products/services in a specified territory for a specified period of time and is obliged to maintain a continuing interest in the business of the franchisee (receiver) in the agreed activity (Hatten, 1997). Therefore, a franchise includes: obligations of both parties, initial/later fees and mode of payment, identified/specified territory, specified duration, termination of agreement procedures, post termination confidentiality and procedure of arbitration. Basic features of a franchise include: ownership by franchiser of some idea/name/ process/equipment, etc., grant of a license for the use/exploitation of such facility to the franchisee, rules of the game of concerned business between the two, and payment of royalty by the franchisee. It is different from an agent who is a person or agency with expressly given authority to act on behalf of the principal and there is no separation of agent from the principal in the eyes of the third parties. The agents do not take title to goods and can work for more than one party (principals). On the other hand, a franchise is a principal-to principal relationship and franchisees usually do not deal with competing products. Thus, a franchisee is also different from a distributor who is an independently owned and financed business which is given certain distribution rights by the supplier for a specified product in a vendor-purchaser relationship and is not obliged to maintain only vendor's products/services unless it is exclusive distribution arrangement. They take titles to goods supplied by the principal. Franchising format can a distribution franchise, product manufacture franchise, trade name or brand franchise, service franchise or business format franchise or a mixture of these types depending on the specific case.

The advantages of franchising for the franchiser include: low investment risk, low cost, wide network facility, and committed/motivated partners. On the other hand, for a franchisee, advantages are: removal of capital constraint, benefit of brand/company image, protection/support of big company, management/professional learning and access to large facilities. On the other hand, disadvantages for a franchisor include: lower

profits than self-owned, supervision costs, potential cheating in payment, and creation of future competitors whereas for the franchisee, the disadvantages could be: difficult in terminating the contract, loss of independence and initiative, bad effect of franchisor /other franchisees on image, dependence on franchisor and cheating/frauds by franchisor (Hatten, 1997). Thus, for a franchisee, it offers an effective governance mechanism which minimises the costs of production and co-ordination while simultaneously delivering entrepreneurial discretion and flexibility, gives economies of production, promotion, and co-ordination and helps market entry and growth, capital access, managerial talent access, and operational control and efficiency.

That agribusiness sector, including farm production services, is a relevant sector for franchising, that too business format franchising, has been argued well in a paper by Rudolph (1999) wherein he argues that it (agriculture) meets the necessary and sufficient conditions for application of franchising strategy. The necessary conditions include: limited growth potential of an individual franchisee due to technological limits, availability of large number of potential franchisees to choose from the more suitable ones, existence of some feasible managerial and administrative function for franchising out for economies of scale and high switching cost, possibility of decentralised decision making for leveraging its benefit compared with a vertically integrated system, credit worthiness of franchisor in the presence of lack of it among franchisees, and irrelevance of idiosyncratic investments. On the other hand, additional or sufficient conditions include: possibility of multiplying learning effects and creation of competitive advantage thru transfer of management skills and technology transfer, pre-selecting the most talented franchisees to achieve dynamic competition, access to credit markets for franchisor, and use of franchising as a countervailing power to oligopolistic market power of the downstream players which are also met in the agribusiness sector (Rudolph, 1999).

Further, franchising can evolve over time as seen in the case of cattle feed case study in Nigeria where the franchisor moved on from just distribution rights to the franchisee to the grant of feed mixing rights with input supply on credit and milling machines over a

period of time which gave the latter better control over characteristics of products but the franchisor continued to maintain quality control by occasionally testing its products in its quality lab (Fosu, 1989). Franchising can also be an alternative to contract farming which fails for various reasons as there are low levels of involvement of the grower most of the time and possibilities of default on produce delivery and payments, besides short term contracts (Rudolph, 1999).

In neighbouring Pakistan, Syngenta- an agricultural input company mainly into seeds and pesticides since 1972 with 22% market share in 2010 has moved to the franchise system called ***Naya Savera*** (new dawn) from traditional dealer based selling of farm inputs. It has three categories of the franchise based on the scale of potential business in the area. Each franchisee is bound to sell only Syngenta products. The franchisee is provided a fixed commission of 8% on the retails price and an additional 2% for achieving sales targets, support in company promotion, has to comply with policy guidelines and contribute to providing advisory service to farmers. The 2% is permitted after approval and transferred at the end of the year. The company stared with 300 franchise outlets in 1997 and reached to 700 by 2010. It has completely done away with conventional dealers to sell Syngenta products. Even Bayer has moved into franchise system in Pakistan with its *Sohni Dharti* (beautiful land) stores, as has FMC with its *Sunehra Daur* (golden age) stores (Riaz, 2010).

In Bangladesh, CARE International adopted micro franchising to provide sustainable access to affordable and quality dairy inputs as a part of its build a dairy value chain of the poor rural households. It roped in 20 local upcoming feed and veterinary medicine shop owners (some run by its trained livestock health workers and others dairy farmer community based feed shops) as micro-franchisees based on their proximity to its project dairy farmers, viability and potential growth of their existing business, and willingness to become franchisees under a common brand name- Krishi Utsho (agro source). The concept of micro franchising is similar to mainstream franchising except that it is more about smaller franchisee partners in poor livelihood contexts. CARE provided initial and annual refresher business training, distribution links with major feed and vet pharma

companies, systems for inventory control and book keeping, attractive store design, common brand name and marketing assistance. They were connected through an SMS texting service based MIS system to track sales and emerging demand preferences of dairy cattle owners. The franchisees are allowed to sell to non-CARE project farmers to achieve economies of scale and financial viability. Women livestock health workers own some shops, and such trained worker shops also offer veterinary services as part of their services. The franchisees signed a formal written contract under which they had to pay an initial franchisee fee and a monthly fee and they were offered commission on sales of various products. The franchisor (CARE) also charged a commission to feed and vet pharma companies to cover its staff costs to some extent. CARE created trust about shop owners among dairy farmers, feed companies and vet pharma companies by advertising and branding of outlets in that these outlets were genuine and sold only branded products fairly under its supervision. The franchising arrangement led to 30% increase in the sales of these shops within six months. There are other potential services like sale of fodder seeds, forage cutting machines, on the spot lab analysis, financial services access, internet access and purchase of milk from dairy farmers which can also be taken up by franchisees to enhance their incomes from such shops (McKague and Siddiquee, 2014).

5.2. Agribusiness franchising in India

There have been only a few experiments in agribusiness franchising in the recent past by some corporate agencies, both private and public, and small agri startups in India. IFFCO, a government of India run national level co-operative has set up franchises in rural areas. It offers businesses like rake handling, transportation, and warehousing of fertilisers and offers help in educational and promotional activities. 1307 Primary Agricultural Co-operative Societies (PACS) have become franchisees of IFFCO and they receive Rs. 60,000 each for purchase of office furniture and agricultural implements. IIFCO-TOKYU ITGIC provides the insurance. By March, 2004, 416 PACS had taken up transport of fertilisers from warehouse to godowns, 110 PACS transport of fertilisers from warehouses to other societies, and 79 PACS had taken up rake handling and transportation. The PACS also sell seeds, pesticides, agricultural implements, and offer credit (see table 5.2 for details).

Table 5.2: A Profile of various franchise models in India

Player> Major franchising aspect	**NAFED**	**IFFCO**	**TCL**	**MSSL**	**SAPPL**
Type of persons roped in as franchisee	Unemployed youth/ex-servicemen	PACS	existing agribusiness entities like input traders or output handlers	Farm input sellers/output traders/commission agents	Farmers/small input traders
Duration of contract	One year	Not known		Three years	Not specified
Initial fee/royalty/commission	Yes	No	An investment of Rs. 75, 000 and working capital Rs. 0.3 million by franchisee	Yes-both	Yes
Exclusive business	Yes	Yes but non-competing products allowed		No	No
Input linkage	Yes	Yes		Yes	Yes
Output linkage	No	No		Yes	Yes
Dispute resolution	Yes	N.A.		Yes	No

Source: Singh, 2014.

A private corporate agribusiness-Mahindra Shubhlabh Services Limited (MSSL-a subsidiary of the tractor major-Mahindra) had set up dozens of franchises in rural India across states to provide one-top solutions to small farmers. MSSL had 57 such outlets in ten states in north, west and southern India, and only three of them were company owned and run. The rest were all run by franchisees. Generally, there was one franchisee in one district and it was exclusive license and business format franchising. Each franchisee had 15-25 spokes (village cluster level outlets). The franchising system made up for 2.5% of

the MSSL's business. Franchisees were selected based on their agricultural input and/or output business volumes and experience in local area. Typically, a franchisee was an *arthiya* (a commission agent) or/and an agro input dealer. A franchisee employed five field staff, each one managing 100 farmers or 500 acres of a crop/s (each farmer growing at least five acres) in a village or cluster of villages, and all of them were supervised by one supervisor. For the farm advisory service, a fee of Rs. 50 was charged in cash from the farmer and the remaining (Rs. 100) in credit recovered at the time of delivery of crop. The crop was monitored regularly by the field staff. The equipment was owned by the franchisee. The franchise contract was for three years initially but extendable. The franchisee got a commission as a distributor of inputs (table 2 for details).

NAFED (National Agricultural Co-operative Marketing Federation Limited- a government of India run co-operative agency) has 2,000 franchisees across eight states of India i.e. Bihar, Jharkhand, Uttaranchal, Punjab, Maharashtra, Tamilnadu and Assam for selling of inputs especially fertilizers (supplied by Indian Farmers' Fertiliser Co-operative, IFFCO) and seeds, with 1,400 of them in U.P. alone (Subramani, 2003). Most of the franchisees are unemployed graduates or ex-servicemen and they have to pay a security deposit in cash. They only need to buy some minimum stock on cash basis, costing about Rs. 10,000. The delivery is on payment basis. NAFED trains these franchisees. They are exclusive dealers of NAFED routed products in a specified territory, have to sell at NAFED determined prices, can sell only to farmers, not trade, and can't deal in competing products. NAFED charges a margin on all the products supplied to the franchisee, which has to be paid on a monthly basis. The franchise agreement is initially for one year but extendable at expiry. The NAFED franchisee is supposed to inform of the sales performance on a weekly basis to the franchisor. It also seeks that franchisee will put up a display board at the outlet with the NAFED service centre name and address on it and another board to display prices of various products. Further, franchisee is to be free from any criminal case or First Information Report (FIR) or from any credit default to any institutional agency like bank or co-operative. It also specifies arbitration procedures in case of dispute.

The Tata group through its arm Tata Chemicals launched Tata *Kisan Sansar* (TKS) in October 2004. Tata Chemicals, incorporated in 1939, is largely into manufacture of fertilizers, pesticides and salt, besides many other chemicals (www.tata.com/tata_chemicals/releases/20041026.htm). Until 2004, the two companies of the group- Rallis and Tata Chemicals -had run separate rural initiatives i.e. Tata Chemical owned a chain called Tata Kisan Kendras in U.P, Haryana, and Punjab which offered the farmers a range of services from agro inputs to financing and advisory services since 1998; and Rallis had a unique programme in M P wherein it partnered with ICICI Bank and HLL in offering farmers various services from inputs to post harvest operations and purchase of produce (Saran et al, 2004). The TKKs were operated by franchisees and each one of them covered 60-70 villages covering about 1500 farmers in 10 km. radius. The franchisees took care of relationship building with farmers, and sometimes also hired out machines to farmers on rentals and were generally local agro businessmen with interest and/or experience in ago input and/or agro output sector.[1]The TKKs were started with the motto of providing the farmer with a package of inputs and services for optimum utilization of balanced primary nutrients; plant protection chemicals; water; seeds; post harvest services; and to develop a genuine partnership with the farmer (Talwar et al, n.d.).

In April, 2003, Rallis' operations which were not sustainable were merged with Tata Chemicals. At that time, Tata Chemicals had 11 mother centers (TKKs) and 300 franchisee TKKs (Talwar, et. al, n.d.). In October, 2004, Tata Chemicals launched its TKKs as TKSs envisioned as a one-stop shop for farmers. At the end of 2004, there were 421 TKSs, all run by franchisees in the above-mentioned three states. These centers were linked to 20 hubs owned by Tata Chemicals. A TKS had three sources of income – sale of inputs, advisory services, and fees charged on sale of partners' goods. There were 15 partners including ICICI Bank, ING, SBI, and agro input companies. The company also undertook contract farming in 15,000 acres of land in the crops of paddy and vegetable seeds in U.P. and Punjab, and fruits in Karnataka and Maharashtra. The produce was sold to food retail chains and exporters (Saran et al, 2004). By 2011, there were 32 hubs and

[1] www.tata.com/tata_chemicals/releases/20041026.htm.

681 TKSs covering 2.7 million farmers across 22000 villages across 88 districts (Kaegi, 2015).

TKKs helped company to reach the farmers more directly by cutting down some intermediaries and dealing with the retailer only. As a consequence, the market share of the company is higher (25-30 per cent) in TKK areas compared with that in other areas (10 per cent). There were also Tata *Kisan Vikas Kendras* (TKVK, a mother center) which served TKS run by the franchisee and the farmer. A TKVK cost about Rs. 20-25 million and spanned a radius of 60 kms. and covered 20 TKSs. In turn, each TKS spanned a radius of around 8 kms. and 60 villages. In 2004, there were 18 TKVKs and 421 TKSs.[2]

Rallis' Kisan Kendras (RKKs) which provided all services ranging from input supply and extension to purchase of farmer produce enrolled farmers as members for Rs. 200 per acre per year and also earned from selling inputs, charging commission (1-2 per cent) on channelising bank loans and on sale of produce to buyers like HLL, Food World and the like. It spent Rs. 2.5-3 million per center with soil testing facilities worth Rs. two million each. RKKs were located in rented premises and other expenses were on training of staff and hiring experts for extension advice (Krishnamacharyulu and Ramakrishnan, 2003) (for details see table 2).

TKSs, which were an upgraded version of TKKs, were one stop shops which provide services like agro inputs, extension, bulk blending of chemicals, training and dissemination, soil and water testing, farm credit and insurance access, and marketing facility with quality and convenience across 14,000 villages in three states in north India. At the village level, the organization was the *Kisan Sahyog Parivar* (farmer co-operation community) the membership of which costing Rs. 200 annually, gave access to credit at low interest rate and an insurance of Rs. 0.1 million. This was present in 256 villages. The company had 130 professional agronomists to assist the farmers. The buy back arrangement had been already provided to farmers in 60 villages in U.P. and Punjab. Farmers could also pay selectively for services of the TKS.[3]

[2] www.tata.com/tata_chemicals/releases/20041026.htm.
[3] www.tata.com/tata_chemicals/releases/20041026.htm.

More recently, a private sector potato supply chain company (*Sidhhivinayak* Agri Processing Private Limited (SAPPL)) has set up a network of 26 franchisees that provides farm input supply and produce buyback service to smallholders (Singh, 2013; for details, see table 2). The SAPPL franchisees are the hubs from which farmers seek and obtain various services like input supply, extension advice and disposal of their output of potato on a pre-agreed price and market outlet. The franchisee are appointed by SAPPL which has extensive experience with farmers and the potato crop and works in many states of India in potato seed supply and output procurement and in turn supplies to various potato processors. SAPPL helps the system work as it lines up markets for the produce and delivers seed and other needed inputs at the franchisee level who are local persons/businesses and close to farmers as they have background in farming and related businesses locally. SAPPL provides all the information, products and even services like soil testing to the farmers through the franchisees and buys back the potato crop thus completing the whole value chain of the potato crop. This is what is needed when one talks of linking farmers with markets as this way their issues of quality and timely input supply and adequate market outlet at a fixed price for farm produce get addressed.

The SAPPL franchise contract specified the categories of the products to be supplied i.e. chemical fertilisers, organic or bio-fertilisers, micronutrient formulations, all crop protection chemicals including bio-control agents, packaging materials, seeds, potato seeds, irrigation equipment, and farm equipments, and controls retail price of the products supplied by it to the franchisees i.e. they could not sell at higher than specified retailing price which might be lower than the Maximum Retail Price (MRP) but was determined and conveyed to the franchisee by the franchisor (company). It also specified the related signage and display was as per the preferences of the franchiser. A franchisee was supposed to spare/offer a minimum investment for the business of franchising. It also offered training to franchisees from time to time as per its contract and even to farmers who were clients of the franchisee. All payments for products were made on delivery in cash or by cheque and, therefore, there was no credit sale or transfer of materials, and the franchisee paid a one-time fee to the franchiser. Thus, product ownership was transferred to the franchisees on delivery and payment for the same. But, since the franchisee was to pay a non-refundable security deposit as well, he/she could buy on credit against that

amount. Further, a minimum quantity of the products supplied by the franchiser was to be maintained by the franchisee at all times. The franchisees were not supposed to sell any other brand and or packaging other than that supplied or agreed by the franchisor (Singh, 2013).

The conditions for becoming a SAPPL franchisee included: having farmer base, accounting knowledge, no political or criminal background and some investment capacity. The non-refundable fee for each franchisee was paid in the case of first 25 franchisees by a development project. A franchisee was also expected to invest a similar for inputs like potato seeds and chemicals etc. In 2012-13, six new franchises paid the franchise fee on their own. SAPPL helped with training, input supply, and in some cases with input licenses. The franchisee in general could sell all non-potato inputs from other companies. The services offered by the franchisee *included:* supply of ***i***nputs (potato and other crop seeds/pesticides/fertilisers), soil and water testing, agricultural implements, technical advisory, training, technology demonstration, and trained spray crew. Proposed services included: crop insurance, and institutional farm credit.

The above discussed models differ in terms of franchisor entity, nature of franchisees, terms and conditions, and commodities and business undertaken ranging from large companies to small companies and co-operatives and startups as franchisors. On the other hand, franchisees are also varied in their size ranging from small farmers to formal firms and entities. The SAPPL franchise model was found to be more effective, as it is decentralized unlike the MSSL model, and does not rely only on existing institutions like the IFFCO model. It reached right upto village or village cluster level with 14 franchisees in one district unlike the single district based franchisee of MSSL. It did not rely on sub-franchisees to interface with the farmer. Further, unlike NAFED, it did not ask for minimum purchases. Also, NAFED and IFFCO franchises are more like exclusive dealer arrangements as they deal only with some farm inputs. Further, SAPPL model covers both input and output sides of the value chain, atleast of potato crop, unlike NAFED or IFFCO which focus only on farm inputs (for details, see table 2). For details of these models and their assessment see Singh (2014).

5.3 Methodology

This chapter profiles and analyses the GAPL agri start up for its franchising model and does this with primary survey of its buying farmers and non-buying farmers in Bihar's two districts where it has substantial presence. To begin with, a few franchisess were selected and interviewed for understanding the franchise model and the franchisee perception of it. Table 5.3 below shows the profile of all the franchises of the GAPL and table 5.4 shows the profile of those interviewed for the case study. In order to assess the effectiveness of GAPL franchise operations and their inclusiveness, we interviewed both farmers buying from franchisee outlets as well as those buying from other sources. Of the total 59% were franchisee buyers and other non-franchise (non-Dehaat) buyers. This was similar across the two districts covered for this study (table 5.5 and 5.6).

Table: 5.3 Details of the GAPL's Dehaat Centres in Bihar as of Nov. 2014

Sr. No.	Name of Dehaat	District	Started in	No. of Villages	No. of Farmers	Average landholding (Acres)	Major Crops
1	Ambara	Muzaffarpur	2013	14	271	2.69	Wheat, Paddy, Watermelon, Litchi
2	Bishanpura	Vaishali	2014	20	303	1.55	Vegetables
3	Bibipur	Vaishali	2013	26	155	3.53	Litchi, Mango, Vegetables
4	Chhitri	Muzaffarpur	2014	14	299	2.6	Litchi, Paddy Wheat
5	Gopalpur	Vaishali	2014	12	58	4.83	Vegetables
6	Jafarpur	Vaishali	2013	68	360	2.7	Litchi, Vegetables
7	Kanti	Muzaffarpur	2013	40	305	3.74	Wheat, Paddy, Maize, Litchi
8	Pokhraira	Muzaffarpur	2013	11	206	2.25	Wheat, Paddy, Litchi, Mango
9	Sitamarhi	Sitamarhi	2014	20	499	1.09	Paddy, Vegetables
10	Hasanpur	Samastipur	2014	25	459	4.46	Wheat, Maize, Litchi, Vegetables
11	Vaishali	Vaishali	2012	93	1153	2.43	Wheat, Paddy, Vegetables, Baby Corn
Total				343	4068	2.41	

Source: F&F, Patna.

Table 5.4: A profile of Franchisees of F&F

District	Block/ Village	Year of start	Education	Operated Land holding (owned)	No. of tubewells owned
Muzaffarpur	Ambara	2013	Graduate	2(2)	2
Muzaffarpur	Chhitri	2014	Higher secondary	3(3)	1
Muzaffarpur	Pokhraira	2013	-Do-	3(1)	0
Vaishali	Vaishali	2011	Graduate	1(3)	1
Vaishali	Bibipur	2013	Post graduate	5(5)	2

Source: primary survey

Table 5.5: Distribution of sample farmers by district and buyer category

District and category	No of Farmers and %age
Muzaffarpur	51
Dehaat Buyer	30
%age	58.82
Non Dehaat Buyer	21
%age	41.18
Vaishali	44
Dehaat Buyer	26
%age	59.09
Non Dehaat Buyer	18
%age	40.91
Total	95
Dehaat Buyer	56
%age	58.95
Non Dehaat Buyer	39
%age	41.05

Table 5.6: Distribution of Sample farmers by district and farmer land category

District and category	No of Farmers and %age
Muzaffarpur	**51**
Marginal Farmers	21
%age	41.18
Small Farmers	21
%age	41.18
Semi Medium Farmers	8.00
%age	15.69
Medium farmers	1.00
%age	1.96
Vaishali	**44**
Marginal Farmers	17
%age	38.64
Small Farmers	19
%age	43.18
Semi Medium Farmers	8
%age	18.18
All	**95**
Marginal Farmers	38
%age	40.00
Small Farmers	40
%age	42.11
Semi Medium Farmers	16
%age	16.84
Medium farmers	1.00
%age	1.05

5.4 GAPL and its franchisee profile

An agribusiness start up to facilitate farmers with better inputs and extension and markets in Bihar in India (GAPL) has used franchising model under which it runs 11 outlets/centres called Dehaat across four districts which cater to a total of 4000 farmer members (who pay Rs. 200 annually each) with each in a 10-12 km. radius with services like soil sample analysis, crop selection, and technical support during the season and marketing of produce. FnF's commercial arm, Green Agrevolution, set up in February 2012 undertakes marketing and processing of farm output (Kumar, 2013). There are two separate identities, one is Farms and Farmers (NGO), which is registered as a society, and the second one is Green Agrevolution Pvt. Ltd. (GAPL)- a commercial entity dealing with the Dehaat centres and sale and purchase of agri inputs and other commercial activities.

The aim of GAPL is to provide 'seed to market' services to growers through the block level outlets called Dehaat which provide information about agricultural practices, prices, supply inputs and handle farmer produce besides providing extension. They target all three aspects of farmer enterprise- yield, cost and output price by undertaking all services related to crop production and its disposal through the franchised outlets called Dehaat which would offer services like soil testing, seed supply, irrigation, extension, market outlet, information about government schemes, contract farming and any other farmer related information. The company has already handled crops like litchi, paddy, baby corn, maize, mustard, and wheat for helping farmers with markets for their produce. It commits to offer higher than market price and make timely payment to farmer for their produce with 50% on the spot and rest within 15 days of purchase. A total 20 salaried employees work for F&F and GAPL with 8 regular employees and 12 in different projects of these two agencies.

In May-June 2014, it started supply of bio inputs. Only seeds were supplied earlier. No chemical fertilizers are supplied because of govt. licensing regulations and a general shortage of these inputs in the peak season. This makes it difficult for it to handle it. GAPL is going step by step to scale up its market by introducing seeds at very first, then bio inputs and then chemical inputs. GAPL is promoting organic farming by organising monthly training/seminars for farmers at each Dehaat centre, and helping them to get all bio-inputs (some with govt. subsidy). Funding was the first issue not to introduce the chemical products in the beginning, and then govt. licensing issues were also there. The biggest obstacle for company operations is the funding. F&F has also started working with a govt. project related to livelihood generation of rural women below poverty line named *Ganga ke Maidani Bhaagon me Mehla Sashaktikaran* (Women empowerment in the plains of the Ganges) through NABARD. Initially it worked on creating SHGs and their bank linkage. In the first two years of project the loan repayment was 100 percent so banks were very happy to continue with that. Women were using these loans as per their own purpose. So NABARD wanted an organisation to provide some organised way of livelihood to those members. So Dehaat started helping the women in growing the vegetables with scientific method. They have also introduced the Goat rearing for women

members. Now Dehaat centres run the project with the help of NABARD. There are 2000 women members working with this project from two districts (1000 from each district with 500 each in vegetable farming and Goatery each). The Dehaat model is also being replicated in Nepal with a prize won by the agency. It is also going to start Dehaats in Odisha. It has floated one Producer Company each in honey, litchi and vegetables. For the last two years, it has been purchasing litchi from trained farmers and selling it further after processing. But, due to some lapses in processing and supply, the company made loss into this business. Now, it has made a deal with a dealer to properly conduct litchi purchase and sale business.

All 11 Dehaat centres in 2013-14 were franchises with GAPL. Each franchisee runs only one Dehaat or outlet. Most of the Dehaat centers are operated from the franchisee's own premises to cut the cost. A Dehaat center covers an area of 5 kms. around it for its operations. Within this radius normally, 15-20 villages are covered for Dehaat operations. A basic criterion for every Dehaat is to cover up to 500 farmers around it but the area and number of villages may vary according to the density of population. Price of the inputs is decided by F&F to control and check whether Dehaat operators are selling at the determined price. Three Dehaats have the license to sell agri inputs, while other non-licensed Dehaat centers are only working as a mediator to supply the inputs to the farmers from F&F. Dehaat are catered to and monitored by centre coordinator who looks after all 10 Dehaats. A centre co-ordinator can take care of 20 Dehaat though that will affect number of visits to Dehaat. Vaishali is the first center which is operated by three salaried employees- one Nodal Officer, One Dehaat Co-ordinator and one office boy. Old Dehaat centres need more care as farmer members and volumes are higher there as against new ones. The products are dispatched to them or they pick up from the Centre. The head office fixed prices for all Dehaats. Farmers demand quality products and those are supplied accordingly though F&F also promote better quality products proactively. Each Dehaat is visited weekly by a coordinator who also participates in farmers meet and visits farmers when there is a problem. There is a product exchange and movement across Dehaats when there is shortage in some of them. The promotion is carried out by the Dehaat operator and also by word of mouth by the Dehaat member farmers.

Soil testing is carried out on payment basis at the rate of Rs. 60 per sample with the help of agricultural universities or *Krishi Vigyan Kendra* (KVK) labs. The Head Office purchases inputs based on demand from the Centre Co-ordinator. Training is also provided, sometimes by Dehaat, but mostly it supplies inputs. If one looks at membership and sales, then F&F is growing year after year. It also supplies vegetable seed besides cereal crop seeds. Though most of the business now is about wheat and rice seed as well as procurement (buyback) but there is some interest in organic farming which is promoted by F&F and it sells bio inputs though it is not certified organic farming. It is to promote lower cost and better resource use and safe food.

GAPL could have sold more inputs, if not doing services like soil and water and extension. Also, there is subsidy on inputs and lack of quality availability. But, GAPL focuses on multiple services to give complete solution to the farmers. Only yield increase will not help. Infact, higher output would lead to lower prices in local markets. Similarly, only output handling will not work as price alone will not help and it would be only a good trader work. It believes that it may grow slowly but each member farmer should be satisfied and then scale up can happen after the total solutions model is tested.

GAPL went in for franchisee model as against COCO model as after two years of operations, it found that it could not reach all farmers on its own. Even though its Dehaats are lower cost, it believes that outsiders cannot do good business in rural areas. Local people trust only locals and employee mentality will not work in such situations especially if it has to manage lower cost operations and still make impact and be viable. It earns less but also has less trouble due to franchisees. Scalability was an issue but training Dehaat operators and sharing profits with them is alright.

Agri input sales are 15-20% of total revenue. 75% of revenue is from output handling and 5% from consultancy. Its share in total cost of input use at farmer level is 10-20% wherever it operates. It is also into wheat and paddy seeds and other inputs as many farmers only grow that and it wants to attract them through these crop dealings to begin

with. More paying are agri input sales but perishables like litchi are even more profitable than agri inputs. Dehaat operator preferences make/decide the portfolio of activities in each centre. No outlet has input sales of more than 30% of total. Vegetables seed are big deal in some centres. But, input sales can not grow as %age of total revenue as output is more in volume and high value. If services are charged, input would be still lower in %age. The focus is on value chain, not just input selling.

F&F also profiled the farmers with more information before they were enrolled as members. The F&F farmer registration fee was Rs. 100 per season which used to be Rs. 100 per year earlier and there was a demand to reduce it to Rs. 100 per year. The members numbered 4000 in late 2014. Besides, there were non-members who did not buy much inputs but there were 1000 such non-members who sold their output and 2000 such farmers use F&F training and helpline facilities. Members were given preference in sale of inputs and purchase of output and were organized into farmer clubs. The farmers were enrolled with information on their address, personal details, photo and their occupation and given a code and registration number. The form was signed by both the farmer and the representative of the agency (GAPL). It also had information on a farmer's sources of inputs like seed, income from farming, number of cattle, place of sale of produce and the agency, occupation other than farming, interest in other occupations and technologies, source of irrigation, whether s/he got soil tests done, was member of any farmer club or SHG, practiced organic farming, had received any training, was willing to try new crops or tried new farming methods and whether had ever tried it, whether leases in land and if so, how much and whether he was aware of government schemes. The details of cropped and cropping pattern were also obtained and for each crop, source of seed, yield and place of sale of produce and price received are also sought for each season. Information on horticulture is sought separately in terms of area, number of tress, and marketing channel and price obtained for these produce.

It also bought back non-chemical produce like water lemon from farmers and sold in local market F&F paid a small premium for non-chemical produce which was bought without any contract with growers. It also promoted and bought a new paddy variety with

buy back arrangement. It supplied grain produce to processors like Godrej for feed (maize) and to some exporters. The prices paid to farmers were *mandi* price based. Farmers wanted more of input services than output services from the agency. It sold only on cash to farmers though there was a need for financial linkage as farmers were not able to buy on cash from Dehaat. It had Nectar brand being used to sell honey and *makhan*a (fox nut).

GAPL recognized that the variety of inputs needs to be increased for scale up and higher market share. Its focus is on service for every need of a producer and based Dehaat revenue on input sales as that was more assured market. Cattle feed was an important input as every farmer had some animals.

It has been able to leverage govt. subsidy for farmer training through ATMA and has received 30% subsidy on cold chains facility, besides crate subsidy for vegetable farmers from NHM under vegetable initiative. It is of the view that it needs to attract more corporates for better viability. Small farmers, cropping pattern and low market potential for high value crops must be reasons for corporates not being interested in this area or state.

Each Dehaat covers many villages like Vaishali caters to 93 villages though many of these are local settlements, not revenue villages. Each village has 15-25 Dehaat farmers on an average but some villages have only 5-6 farmers each. But, some villages have many dozen farmers each.

5.41 The franchisee model

There are some minimum conditions for choosing a franchisee like integrity and commitment besides capability to run it. Therefore, there is age specification for a franchisee, educational qualification (10^{th} or 12^{th} pass) with five year vocational experience, non-political but good social reputation besides ability to deal with people and some experience of running an enterprise or working with a rural business company for at least one year. There should not be another Dehaat in 10 sq. km. area near the

Dehaat. The agreement seeks that franchisee would provide space for setting up the Dehaat and if hired pay rent for it. The franchisee is to promote Dehaat among farmers and make them members, will reach farmer need for various services like input supply, extension and sale of produce to the company office bears and also monitor the crops grown by farmers from time to time. He would also organize farmers into farmer clubs or SHGs of 10-15 each and hold their meetings weekly or fortnightly and help solve their farming related problems or approach company for the same. A member farmer would maintain a card in which all transaction with farmer member by Dehaat would be recorded on a regular basis by the franchisee. The renewal of these cards annually was also franchisee responsibility and all old cards were to be deposited with the company.

All the products/services to be sold from the Dehaat outlet were to be with permission from the company and the list of products/services to be transacted was to be jointly decided by the franchisee and the company and was renewable from time to time. The sale of any product/service was to be with a receipt to the farmer or any other receipt or sale was to be with bill/invoice only. The company was to decide the prices of all products sold from the Dehaat outlets. All profits from Dehaat were shared between the company and the Dehaat franchisee on mutually agreed basis depending on the product or service but generally franchisee was to get at least 75% of profits. All sales returns could be made only within a week of delivery to the franchisee if the company had been informed of it.

The company was to help franchisee in getting access to finance for better running of it but it did not promise it in anyway. Each franchise was to stick to the outlet working hours after mutually agreeing on it failing which franchise could be withdrawn. All supplies to franchisee were made on 50% advance payment and the rest 50% within seven days after delivery of products. The franchisee was to provide all the Dehaat connected farmer related information to the company on a regular basis and had to participate in all meetings organised by the company. He was to follow all instructions given by company. The franchise was withdrawn if the franchisee undertook any unauthorized activities, sold any product or service without approval, misbehaved with

farmers, cheated farmers, participated in any political activities, or did not achieve targets continuously for three months. If he was found to do any financial misappropriation, even then franchise was withdrawn and legal action taken. The company was to provide all promotional materials to the Dehaat outlet and train the franchisee in English language, computer operations and accounting and provide hands on training at another Dehaat. In the first four months, the franchisee was to work under an induction program of the company on a pilot project on successful completion of which the franchise was granted.

Earlier franchisees did not pay any initial fees but the new Dehaats give Rs. 50000 security of which Rs. 25000 is used to provide inputs on credit. Earlier, it was only Rs. 10,000 and input supply was on credit which led to problem of loan recoveries. They can run the business from home also. Formal outlet is not must. There is a formal franchise agreement with Dehaat operators. Profits are shared with Dehaat operators depending on activity and all franchises have similar terms. In paddy, each Dehaat gets per tonne commission on procurement. There is no progressive payment system to encourage better performance as of now. New and old Dehaat were treated the same way. It was just based on number of farmers served and volumes sold or bought. Inventories at Dehaat level are very low. The inputs were sold to them on cash basis but a return was guaranteed within a week, if not sold. Nodal office had more inventories but not Dehaat which had only inventory for a week or less. 5-7% of sold materials were returned and these were sold to other outlets.

Most of them were set up in 2013 or 2014 with only one being from 2011. They were fairly educated with graduate or post graduation in majority cases and all had attended one week Dehaat training to begin with. They reported working from 8 hours to as many as 14 hours for their business. All of them were landowners and operators and had tubewell owned in most cases except one. Only two had tractors. Though they grew predominantly wheat and paddy (tables 5.7) but some of them did grow new and high value crops like green gram, maize, potato and other vegetables.

For example, one of the earliest (Ambara) franchisees was a graduate and an active social worker linked to Social Unity Centre of India (SUCI) since 1992 in the local area. He had a good image among local people. He also had an insurance advisor license from LIC and his wife was ANM with monthly salary of Rs. 35000 per month. He cultivated two tubewell irrigated 2.5 acres of joint family land with tractor and other equipment (also used for hardware business) growing wheat, paddy, potato and vegetables. He also had a hardware business earlier for 10 years which he handed over to his brother. After that, he started working with F&F.

He joined F&F on the referral of the Vaishali centre co-ordinator who thought that he could run the centre well. Dehaat center outlet was on rent costing Rs. 700 per month including water and electricity charges. He had not made any initial investment at the beginning of it, and all of the inputs provided to him for sale were on credit. His total revenue was Rs. 15 lakh in 2013-2014 which was the first year for him. Famers who purchased seeds on regular basis also asked for chemical fertilizers and pesticides, but F&F didn't provide these products. If the chemical fertilisers were introduced, it would increase Dehaat turnover fourfold as watermelon and other similar short span crops required more fertilizers. The handling of watermelon and potato was crucial in this area for farmer benefit.

Major portion of the business was from paddy and wheat seeds (Rs. one lakh) and purchase of wheat and paddy crops (Rs. 14 lakh). All of his income came from commission paid to him for the sale of seeds and other inputs (5%) and also for the purchase of output at the rate of Rs. 10 per quintal. He made a gross revenue of Rs. 17000 and net profit of Rs. 1000 per month. But, second year sales are higher of the order of Rs. 10 lakh of which wheat and paddy seeds are 40% in value and output sale of the order of Rs. one crore and the target is Rs. 2 crore turnover for 2014-15 giving him gross revenue of the order of Rs. 1.5 lakh and net income of Rs. 1.4 lakh per month. Seed sales accounted for only 10% of sales revenue of the Dehaat centre. He dealt with 1000 famers in sale of inputs, and around 400 farmers for purchase of output and the centre covers 10-12 square kms. area and there was another Dehaat in the area at a distance of one km.

from this Dehaat. There is no overlap of farmers across Dehaat centres. The interviewee Dehaat operator also provided soil-testing services to farmers by charging Rs. 60 per sample. He collected samples from farmers and sent to Vaishali for testing. Farmers preferred Dehaat to buy seed because it always provided genuine seed with government subsidy and on time. For sale of output too, farmers preferred Dehaat because it provided cash at the time of sale, and it also picked up the produce directly from their doorstep. His nearest competitors in output purchase (wheat and paddy) were PACS at the *Panchayat* level but their operations were not regular.

According to him, 50% of the farmer members of Dehaat preferred it for sale of output while other 50% members preferred PACS because of higher price offered by the PACS. Paddy contributed 70% and wheat 30% of total output purchased by Dehaat. But, in the case of purchase of seeds, 90% farmer members preferred Dehaat instead of other sources because of good quality and lower price. Most of the seed sales were in Rabi season than other seasons because of number of crops sown during this season was much higher than those in other seasons. Average land holding per member among his members was two acres. Out of 500 farmer members, 200 were marginal farmers, 200 small farmers, and others semi-medium or medium or large farmers. Around 20 farmer members had tractors, while others took them on rental basis.

Another franchisee was from a non-farming background though had some family land which was leased out, and had experience of running a canteen in Jharkhand before taking up this activity. He took up Dehaat centre a couple of months ago to do something in the local area through this enterprise and runs it from his home. He catered to 300 member farmers in his area. Depending on the location and year of start, the turnover varied from a low of less than Rs. two lakh to as much as Rs. 30 lakh per annum and this was directly proportionate to the number of villages and farmers catered to by the franchisees and those buying inputs (table 5.8 and 5.9).

Table 5.7: Distribution of franchisees by their cropping pattern

Season>	*Kharif*			*Rabi*				*Zaid*	
Franchisee	**Paddy**	**Maize**	**Vegetables**	**Wheat**	**Maize**	***Toriya***	**Potato**	**Green gram**	**Vegetables**
Ambara	2	0	0	1.75	0	0	0.25	2	0
Chhitri	2	0	0	2	0	0.5	0.5	3	0
Pokhraira	1.5	0.5	0	1.5	0.5	0	1	1	0.5
Vaishali	0.75	0.25	0	0.75	0	0	0.25	0.5	0
Bibipur	3	1	1	4	0	0	1	2	2
All	9.25	1.75	1	10	0.5	0.5	3	8.5	2.5

Table 5.8: Distribution of franchises by Farmer membership profile

Franchisee	Farmer-member villages	Farmer-members	Active members	Passive members	Farmer-members buying inputs (annual)	Non-members buying inputs (annual)
Ambara	35	1000	150	850	500	300
Chhitri	5	450	150	300	100	20
Pokhraira	150	400	200	200	200	1200
Vaishali	45	900	900	450	800	300
Bibipur	80	1000	400	600	500	500

Table 5.9: Annual turnover of GAPL Franchisees in 2014-15

Franchisee	Annual Turnover (in lakh)
Ambara	15
Chhitri	1.75
Pokhraira	17
Vaishali	25
Bibipur	30

Most of the franchisees had tried introducing new inputs in the last season except one and this ranged from 5-20 products and were there last year as well and as many as 20-100 farmers had bought such products in each case. Further, all of them had purchased output and had bought 1-3 crops each either directly purchasing or under a contract farming arrangement for the franchisor who in turn sold it to the ultimate buyer. They also claimed that the price paid to farmers under such arrangement was higher than the market prices in all cases.

No franchisee undertook water testing. All provided advice on use of fertilizers/crop protection/agri machinery, field demo/trails of farm inputs, information about innovative/improved methods of agricultural practices, information about government schemes (subsidies), technology, information about output price and Marketing/sales support for output and only one had taken farmers for exhibition visit/agricultural fair.

All franchisees sold 4 or 5 products and these included seeds, bio-fertilisers, bio-pesticides, biofungicides and plant growth promoters. Seeds were the most common products with all or at least four selling them followed by biopesticides and PGPs and bio-fungicide being the least common among franchises with four selling one each such product. The number of fast moving products ranged from 4-5 in case of different franchisees and this was for reasons of high yield in case of seeds, better crop protection in case of pesticides/biopesticides or better quality of output or a combinations of these factors in one case. On the other hand, slow moving products ranged from one to three and the reasons for this were either high price in four cases or non-availability in required pack size in one case.

5.5 Farmer level assessment of franchise operations

Most of the interviewed farmers were marginal or small in both categories given the profile of farmers in Bihar in general (table 5.10). In general, farmer average age was lower in Vaishali than in Muzaffarpur and there was no difference between buyers and non-buyers so far as age was concerned (table 5.11). There was no difference in age across land holding categories.

Table 5.10: Distribution of Dehaat farmers by category

District > Category and percentage	Muzaffarpur	Vaishali	All
Dehaat Buyer	**30**	**26**	**56**
%age	58.82	59.09	58.95
Marginal Farmers	12	9	21
%age	23.53	20.45	22.11
Small Farmers	12	11	23
%age	23.53	25	24.21
Semi Medium Farmers	5	6	11
%age	9.8	13.64	11.58
Medium farmers	1	0	1
%age	1.96	0	1.05
Non Dehaat Buyer	**21**	**18**	**39**
%age	58.82	40.91	50.53
Marginal Farmers	9	8	17
%age	17.65	18.18	17.89
Small Farmers	9	8	17
%age	17.65	18.18	17.89
Semi Medium Farmers	3	2	5
%age	5.88	4.55	5.26

Table 5.11: Distribution of farmers by age group and land category

Age group (in years) > District and category	21-30	31-40	41-50	51-60	61-70	71 & >	Total
Muzaffarpur	**4**	**12**	**9**	**16**	**9**	**1**	**51**
%age	7.84	23.53	17.65	31.37	17.65	1.96	100.00
Average age	24.75	39.92	48	56	64.44	75	49.51
Marginal Farmers	0	6	3	9	3	0	21
%age	0.00	11.76	5.88	17.65	5.88	0.00	41.18
Average	0	36.33	47.33	56	66	0	50.57
Small Farmers	3	2	6	5	5	0	21
%age	5.88	3.92	11.76	9.80	9.80	0.00	41.18
Average	25.00	36.50	48.33	56.40	64.00	0.00	49.52
Semi Medium Farmers	1.00	3.00	0.00	2.00	1.00	1.00	8.00
%age	1.96	5.88	0.00	3.92	1.96	1.96	15.69
Average	24.00	38.33	0.00	55.00	62.00	75.00	48.25
Medium farmers	0.00	1.00	0.00	0.00	0.00	0.00	1.00
%age	0.00	1.96	0.00	0.00	0.00	0.00	1.96
Average	0	37	0	0	0	0	37
Vaishali	**4**	**16**	**16**	**6**	**2**	**0**	**44**
%age	9.09	36.36	36.36	13.64	4.55	0.00	100.00
Average age	29	36.62	45.69	55.5	67.5	0	43.2
Marginal Farmers	0	8	6	2	1	0	17

%age	0.00	18.18	13.64	4.55	2.27	0.00	38.64
Average	0	37.12	45	51.5	70	0	43.53
Small Farmers	3	5	9	2	0	0	19
%age	6.82	11.36	20.45	4.55	0.00	0.00	43.18
Average	29	35.8	46.22	57.5	0	0	41.95
Semi Medium Farmers	1	3	1	2	1	0	8
%age	2.27	6.82	2.27	4.55	2.27	0.00	18.18
Average	29	36.67	45	57.5	65	0	45.5
All	**8**	**28**	**25**	**22**	**11**	**1**	**95**
%age	8.42	29.47	26.32	23.16	11.58	1.05	100.00
Average age	26.87	36.75	46.52	55.86	65	75	46.59
Marginal Farmers	0	14	9	11	4	0	38
%age	0.00	14.74	9.47	11.58	4.21	0.00	40.00
Average	0	36.79	45.78	55.18	67	0	47.42
Small Farmers	6	7	15	7	5	0	40
%age	6.32	7.37	15.79	7.37	5.26	0.00	42.11
Average	27	36	47.07	56.71	64	0.00	45.92
Semi Medium Farmers	2	6	1	4	2	1.00	16
%age	2.11	6.32	1.05	4.21	2.11	1.05	16.84
Average	26.5	37.5	45	56.25	63.5	75.00	46.87
Medium farmers	0.00	1.00	0.00	0.00	0.00	0.00	1.00
%age	0.00	1.05	0.00	0.00	0.00	0.00	1.05
Average	0	37	0	0	0	0	37

Table 5.12: Distribution of Dehaat and Non-Dehaat farmers by literacy level and category

Education Level> District and category	**Illiterate**	**Primary**	**Secondary**	**Senior Secondary**	**Higher Secondary**	**Graduate**	**Post Graduate**	**Total**
Muzaffarpur	**6**	**9**	**7**	**18**	**8**	**3**	**0**	**51**
%age	11.76	17.65	13.73	35.29	15.69	5.88	0	100
Dehaat Buyer	3	5	4	10	6	2	0	30
%age	5.88	9.80	7.84	19.61	11.76	3.92	0	58.82
Non Dehaat Buyer	3	4	3	8	2	1	0	21
%age	5.88	7.84	5.88	15.69	3.92	1.96	0	41.18
Vaishali	**1**	**3**	**7**	**24**	**4**	**3**	**2**	**44**
%age	2.27	6.82	15.91	54.55	9.09	6.82	4.55	100
Dehaat Buyer	1	1	3	15	1	3	2	26
%age	2.27	2.27	6.82	34.09	2.27	6.82	4.55	59.09
Non Dehaat Buyer	0	2	4	9	3	0	0	18
%age	0	4.55	9.09	20.45	6.82	0	0	40.91
All	**7**	**12**	**14**	**42**	**12**	**6**	**2**	**95**

%age	7.37	12.63	14.74	44.21	12.63	6.32	2.11	100
Dehaat Buyer	4	6	7	25	7	5	2	56
%age	4.21	6.32	7.37	26.32	7.37	5.26	2.11	58.95
Non Dehaat Buyer	3	6	7	17	5	1	0	39
%age	3.16	6.32	7.37	17.89	5.26	1.05	0	41.05

The Dehaat farmers were generally more literate than their non-dehaat counterparts, some being graduates and postgraduates. But, this was not true across categories of farmers in terms of land holding (tables 5.12 and 5.13).

Table 5.13: Distribution of farmers by Literacy level and landholding category

Education Level> District and category	**Illiterate**	**Primary**	**Secondary**	**Senior Secondary**	**Higher Secondary**	**Graduate**	**Post Graduate**	**Total**
Muzaffarpur	**6**	**9**	**7**	**18**	**8**	**3**	**0**	**51**
%age	**11.76**	**17.65**	**13.73**	**35.29**	**15.69**	**5.88**	**0**	**100**
Marginal Farmers	3	7	3	4	2	2	0	21
%age	5.88	13.73	5.88	7.84	3.92	3.92	0	41.18
Small Farmers	3	2	3	9	4	0	0	21
%age	5.88	3.92	5.88	17.65	7.84	0	0	41.18
Semi Medium Farmers	0	0	1	5	2	0	0	8
%age	0	0	1.96	9.80	3.92	0	0	15.69
Medium farmers	0	0	0	0	0	1	0	1
%age	0	0	0	0	0	1.96	0	1.96
Vaishali	**1**	**3**	**7**	**24**	**4**	**3**	**2**	**44**
%age	**2.27**	**6.82**	**15.91**	**54.55**	**9.09**	**6.82**	**4.55**	**100**
Marginal Farmers	1	3	1	10	0	1	1	17
%age	2.27	6.82	2.27	22.73	0	2.27	2.27	38.64
Small Farmers	0	0	6	9	3	1	0	19
%age	0	0	13.64	20.45	6.82	2.27	0	43.18
Semi Medium Farmers	0	0	0	5	1	1	1	8
%age	0	0	0	11.36	2.27	2.27	2.27	18.18
All	**7**	**12**	**14**	**42**	**12**	**6**	**2**	**95**
%age	**7.37**	**12.63**	**14.74**	**44.21**	**12.63**	**6.32**	**2.11**	**100**
Marginal Farmers	4	10	4	14	2	3	1	38
%age	4.21	10.53	4.21	14.74	2.11	3.16	1.05	40

Small Farmers	3	2	9	18	7	1	0	40
%age	3.16	2.11	9.47	18.95	7.37	1.05	0	42.11
Semi Medium Farmers	0	0	1	10	3	1	1	16
%age	0	0	1.05	10.53	3.16	1.05	1.05	16.84
Medium farmers	0	0	0	0	0	1	0	1
%age	0	0	0	0	0	1.05	0	1.05

Most of the farmers belonged to OBC and general categories across districts and *Rajputs* and *Bhumihaa*r, and *Yadavs* and *Khuswahas* together each accounting for almost 40% of the total with the only other caste with significant numbers being *Kurmis*. There were a few SC farmers in Muzzaffarpur alone. Most of the SC and BC caste farmers had marginal or small holdings (tables 5.14 and 5.15).

The farmers in Bihar are generally smallholders by and large with 92% operating less than 2 hectares. But, Dehaat farmers in general were larger than their non-Dehaat counterparts both in owned and operated land holdings. Whereas overall owned land on an average was 3.33 acres, it was 3.71 acres for Dehaat buyers and 2.78 acres in case of non-Dehaat farmers. Further across districts, it was 3.48 acres for Dehaat versus 2.63 acres for non-Dehaat in Muzzafarpur and in Vaishali, it was 3.98 acres versus 2.96 acres respectively. Operated holdings came out to be 3.63 acres on an average but 3.89 acres and 3.27 acres for Dehaat and non-Dehaat categories respectably. Muzzafarpur had even larger departure from average of 3.62 acres with Dehaat going up to 3.91 acres and non-dehaat 3.2 acres with that in Vaishali being 3.87 acres and 3.35 acres respectively with over all average size being 3.65 acres. This also shows some amount of leasing in practice which is about 9% of total operated land (tables 5.16 and 5.17).

Table 5.14: Distribution of farmers by Caste category

Caste Category	OBC								Gen		SC	Total
Type of Caste > District and type of buyer	***Kushwaha***	***Yadav***	***Chandrabanshi***	***Kurmi***	***Kumhaar***	***Teli***	***Lohar***	***Nai***	***Bhumihaar***	***Rajput***	***Chamaar***	
Muzaffarpur	14	7	1	4	3	0	0	2	6	12	2	**51**
%age	27.45	13.73	1.96	7.84	5.88	0	0	3.92	11.76	23.53	3.92	100
Dehaat Buyer	10	3	0	1	1	0	0	1	4	8	2	30
%age	19.61	5.88	0	1.96	1.96	0	0	1.96	7.84	15.69	3.92	58.82
Non Dehaat Buyer	4	4	1	3	2	0	0	1	2	4	0	21
%age	7.84	7.84	1.96	5.88	3.92	0	0	1.96	3.92	7.84	0	41.18
Vaishali	7	8	0	3	1	2	1	3	9	10	0	**44**
%age	15.91	18.18	0	6.82	2.27	4.55	2.27	6.82	20.45	22.73	0	100
Dehaat Buyer	5	7	0	0	1	0	1	0	9	3	0	26
%age	11.36	15.91	0	0	2.27	0	2.27	0	20.45	6.82	0	59.09
Non Dehaat Buyer	2	1	0	3	0	2	0	3	0	7	0	18
%age	4.55	2.27	0	6.82	0	4.55	0	6.82	0	15.91	0	40.91
All	21	15	1	7	4	2	1	5	15	22	2	**95**
%age	22.11	15.79	1.05	7.37	4.21	2.11	1.05	5.26	15.79	23.16	2.11	100
Dehaat Buyer	15	10	0	1	2	0	1	1	13	11	2	56
%age	15.79	10.53	0	1.05	2.11	0	1.05	1.05	13.68	11.58	2.11	58.95
Non Dehaat Buyer	6	5	1	6	2	2	0	4	2	11	0	39
%age	6.32	5.26	1.05	6.32	2.11	2.11	0	4.21	2.11	11.58	0	41.05

Table 5.15: Distribution of farmers by Caste and land category

Caste Category	**OBC**								**Gen**		**SC**	**Total**
Type of Caste >	*Kushwaha*	*Yadav*	*Chandrabanshi*	*Kurmi*	*Kumhaar*	*Teli*	*Lohar*	*Nai*	*Bhumiyar*	*Rajput*	*Chmaar*	
District and type of farmer												
Muzaffarpur	14	7	1	4	3	0	0	2	6	12	2	**51**
%age	27.45	13.73	1.96	7.84	5.88	0	0	3.92	11.76	23.53	3.92	100
Marginal Farmers	7	2	1	3	3	0	0	1	0	2	2	21
%age	13.73	3.92	1.96	5.88	5.88	0	0	1.96	0	3.92	3.92	41.18
Small Farmers	4	3	0	1	0	0	0	1	3	9	0	21
%age	7.84	5.88	0	1.96	0	0	0	1.96	5.88	17.65	0	41.18
Semi Medium Farmers	3	2	0	0	0	0	0	0	2	1	0	8
%age	5.88	3.92	0	0	0	0	0	0	3.92	1.96	0	15.69
Medium farmers	0	0	0	0	0	0	0	0	1	0	0	1
%age	0	0	0	0	0	0	0	0	1.96	0	0	1.96
Vaishali	7	8	0	3	1	2	1	3	9	10	0	**44**
%age	15.91	18.18	0	6.82	2.27	4.55	2.27	6.82	20.45	22.73	0	100
Marginal Farmers	3	3	0	1	1	1	1	2	3	2	0	17
%age	6.82	6.82	0	2.27	2.27	2.27	2.27	4.55	6.82	4.55	0	38.64
Small Farmers	3	3	0	2	0	1	0	1	5	4	0	19
%age	6.82	6.82	0	4.55	0	2.27	0	2.27	11.36	9.09	0	43.18
Semi Medium Farmers	1	2	0	0	0	0	0	0	1	4	0	8
%age	2.27	4.55	0	0	0	0	0	0	2.27	9.09	0	18.18
All	21	15	1	7	4	2	1	5	15	22	2	**95**
%age	22.11	15.79	1.05	7.37	4.21	2.11	1.05	5.26	15.79	23.16	2.11	100
Marginal Farmers	10	5	1	4	4	1	1	3	3	4	2	38
%age	10.53	5.26	1.05	4.21	4.21	1.05	1.05	3.16	3.16	4.21	2.11	40
Small Farmers	7	6	0	3	0	1	0	2	8	13	0	40
%age	7.37	6.32	0	3.16	0	1.05	0	2.11	8.42	13.68	0	42.11
Semi Medium Farmers	4	4	0	0	0	0	0	0	3	5	0	16
%age	4.21	4.21	0	0	0	0	0	0	3.16	5.26	0	16.84
Medium farmers	0	0	0	0	0	0	0	0	1	0	0	1
%age	0	0	0	0	0	0	0	0	1.05	0	0	1.05

Table 5.16: Distribution of farmers by District and own land holding category

Category> **District and land share and average**	**Marginal Farmers**	**Small Farmers**	**Semi Medium Farmers**	**Medium farmers**	**Total**
Muzaffarpur	29	13	8	1	51
Land (in acre)	42.75	54.5	49.5	13	159.75
%age	26.76	34.12	30.99	8.14	100
Average	1.47	4.19	6.19	13	3.13
Dehaat Buyer	15	9	5	1	30
Land (in acre)	22.5	38.5	30.5	13	104.5
%age	14.08	24.1	19.09	8.14	65.41
Average	1.5	4.28	6.1	13	3.48
Non Dehaat Buyer	14	4	3	0	21
Land (in acre)	20.25	16	19	0	55.25
%age	12.68	10.02	11.89	0	34.59
Average	1.45	4	6.33	0	2.63
Vaishali	18	18	8	0	44
Land (in acre)	28.75	71.5	56.5	0	156.75
%age	18.34	45.61	36.04	0	100
Average	1.6	3.97	7.06	0	3.56
Dehaat Buyer	8	12	6	0	26
Land (in acre)	13.5	46.5	43.5	0	103.5
%age	8.61	29.67	27.75	0	66.03
Average	1.69	3.87	7.25	0	3.98
Non Dehaat Buyer	10	6	2	0	18
Land (in acre)	15.25	25	13	0	53.25
%age	9.73	15.95	8.29	0	33.97
Average	1.52	4.17	6.5	0	2.96
All	47	31	16	1	95
Land (in acre)	71.5	126	106	13	316.5
%age	22.59	39.81	33.49	4.11	100
Average	1.52	4.06	6.62	13	3.33
Dehaat Buyer	23	21	11	1	56
Land (in acre)	36	85	74	13	208
%age	11.37	26.86	23.38	4.11	65.72
Average	1.56	4.05	6.73	13	3.71
Non Dehaat Buyer	24	10	5	0	39
Land (in acre)	35.5	41	32	0	108.5
%age	11.22	12.95	10.11	0	34.28
Average	1.48	4.1	6.4	0	2.78

Table 5.17: Distribution of farmers by District and Operated Land Holding Category

Category> District, land share and average land	MF	SF	SMF	MF	Total
Muzaffarpur	21	21	8	1	51
Land (in acre)	38.5	81.5	51.5	13	184.5
%age	20.87	44.17	27.91	7.05	100
Average	1.83	3.88	6.44	13	3.62
Dehaat Buyer	12	12	5	1	30
Land (in acre)	21.75	50	32.5	13	117.25
%age	11.79	27.10	17.62	7.05	63.55
Average	1.81	3.17	6.5	13	3.91
Non Dehaat Buyer	9	9	3	0	21
Land (in acre)	16.75	31.5	19	0	67.25
%age	9.08	17.07	10.30	0	36.45
Average	1.86	3.5	6.33	0	3.2
Vaishali	17	19	8	0	44
Land (in acre)	30.75	75	55	0	160.75
%age	19.13	46.66	34.21	0	100
Average	1.81	3.95	6.87	0	3.65
Dehaat Buyer	9	11	6	0	26
Land (in acre)	16	42.5	42	0	100.5
%age	9.95	26.44	26.13	0	62.52
Average	1.79	3.86	7	0	3.87
Non Dehaat Buyer	8	8	2	0	18
Land (in acre)	14.75	32.5	13	0	60.25
%age	9.18	20.22	8.09	0	37.48
Average	1.84	3.06	6.5	0	3.35
All	38	40	16	1	95
Land (in acre)	69.25	156.5	106.5	13	345.25
%age	20.06	45.33	30.85	3.77	100
Average	1.82	3.91	6.66	13	3.63
Dehaat Buyer	21	23	11	1	56
Land (in acre)	37.75	92.5	74.5	13	217.75
%age	10.93	26.79	21.58	3.77	63.07
Average	1.8	4.02	6.77	13	3.89
Non Dehaat Buyer	17	17	5	0	39
Land (in acre)	31.5	64	32	0	127.5
%age	9.12	18.54	9.27	0	36.93
Average	1.85	3.76	6.4	0	3.27

In general, Dehaat farmers cultivated more area under high value crops like fruits, vegetables, potato and maize than their non-Dehaat counterparts (table 5.18). Further, small farmers in

general had larger proportion of their area under vegetables than the other categories though their absolute average area was smaller than those grown under vegetables by other categories and this held across districts (table 5.19).

But, in general, Dehaat farmers had lower cropping intensity than the non-Dehaat counterparts across both districts. One reason for this could be the higher area under fruit crops- perennial or annual crops. But, across both categories, marginal and small farmers had a higher cropping intensity than that of other categories. (tables 5.20 and 5.21). This is quite expected as small farmers are more intensive cultivators of their smaller holdings.

Table 5.18: Distribution of farmers by District and buyer category wise cropping pattern

Season>	**Annual**	***Kharif***			***Rabi***				***Zaid***		
Crops > District and area under crop share and average area	**Orchard**	**Paddy**	**Maize**	**Vegetables**	**Wheat**	**Maize**	***Toriya***	**Potato**	**Green Gram**	**Vegetables**	**Gross Area**
Muzaffarpur	16	51	28	15	51	10	20	33	50	4	278
Land sown (in acre)	14.5	110.75	25.25	15.25	108.25	8.5	14.75	32.75	83	3.5	416.5
%age	3.48	26.59	6.06	3.66	25.99	2.04	3.54	7.86	19.93	0.84	100
Average	0.91	2.17	0.9	1.02	2.12	0.85	0.74	0.99	1.66	0.87	1.5
Dehaat Buyer	10	30	18	11	30	7	13	18	29	3	169
Land sown (in acre)	10	67	17.5	10.25	65.75	6	9.5	21	44.5	3	254.5
%age	2.40	16.09	4.20	2.46	15.79	1.44	2.28	5.04	10.68	0.72	61.10
Average	1	2.23	0.97	0.93	2.19	0.86	0.73	1.17	1.53	1	1.51
Non Dehaat Buyer	6	21	10	4	21	3	7	15	21	1	109
Land sown (in acre)	4.5	43.75	7.75	5	42.5	2.5	5.25	11.75	38.5	0.5	162
%age	1.08	10.50	1.86	1.20	10.20	0.60	1.26	2.82	9.24	0.12	38.90
Average	0.75	2.08	0.77	1.25	2.02	0.83	0.75	0.78	1.83	0.5	1.49
Vaishali	6	44	21	19	44	13	18	37	44	14	260
Land sown (in acre)	5.75	92.75	21	19.5	88.75	11.75	14.5	37.5	68.75	17	377.25
%age	1.52	24.59	5.57	5.17	23.53	3.11	3.84	9.94	18.22	4.51	100
Average	0.96	2.11	1	1.03	2.02	0.9	0.81	1.01	1.56	1.21	1.45
Dehaat Buyer	5	26	11	12	26	7	11	21	26	9	154
Land sown (in acre)	5.25	52.5	10.5	14	53	6.75	10	23.5	43	12	230.5
%age	1.39	13.92	2.78	3.71	14.05	1.79	2.65	6.23	11.40	3.18	61.10
Average	1.05	2.01	0.95	1.17	2.04	0.96	0.91	1.12	1.65	1.33	1.5
Non Dehaat Buyer	1	18	10	7	18	6	7	16	18	5	106
Land sown (in acre)	0.5	40.25	10.5	5.5	35.75	5	4.5	14	25.75	5	146.75

%age	0.13	10.67	2.78	1.46	9.48	1.33	1.19	3.71	6.83	1.33	38.90
Average	0.5	2.24	1.05	0.79	1.99	0.83	0.64	0.87	1.43	1	1.38
All	22	95	49	34	95	23	38	70	94	18	538
Land sown (in acre)	20.25	203.5	46.25	34.75	197	20.25	29.25	70.25	151.75	20.5	793.75
%age	2.55	25.64	5.83	4.38	24.82	2.55	3.69	8.85	19.12	2.58	100
Average	0.92	2.14	0.94	1.02	2.07	0.88	0.77	1	1.61	1.14	1.48
Dehaat Buyer	15	56	29	23	56	14	24	39	55	12	323
Land sown (in acre)	15.25	119.5	28	24.25	118.75	12.75	19.5	44.5	87.5	15	485
%age	1.92	15.06	3.53	3.06	14.96	1.61	2.46	5.61	11.02	1.89	61.10
Average	1.02	2.13	0.97	1.05	2.12	0.91	0.81	1.14	1.59	1.25	1.50
Non Dehaat Buyer	7	39	20	11	39	9	14	31	39	6	215
Land sown (in acre)	5	84	18.25	10.5	78.25	7.5	9.75	25.75	64.25	5.5	308.75
%age	0.63	10.58	2.30	1.32	9.86	0.94	1.23	3.24	8.09	0.69	38.90
Average	0.71	2.15	0.91	0.95	2.01	0.83	0.70	0.83	1.65	0.92	1.44

Table 5.19: Distribution of farmers by District and farmer category wise cropping pattern

Season>	**Annual**	***Kharif***			***Rabi***				***Zaid***		**Gross Area**
Crops > District, area under crop share and average area	**Orchard**	**Paddy**	**Maize**	**Vegetables**	**Wheat**	**Maize**	**Toriya**	**Potato**	**Green Gram**	**Vegetables**	
Muzaffarpur	16	51	28	15	51	10	20	33	50	4	278
Land sown (in acre)	14.5	110.75	25.25	15.25	108.25	8.5	14.75	32.75	83	3.5	416.5
%age	3.48	26.59	6.06	3.66	25.99	2.04	3.54	7.86	19.93	0.84	100
Average	0.91	2.17	0.9	1.02	2.12	0.85	0.74	0.99	1.66	0.87	1.5
Marginal Farmers	2	21	10	6	21	2	4	14	20	3	103
Land sown (in acre)	1.25	27.5	5.5	3.25	25.5	1.5	1.75	7.75	22.5	2.5	99
%age	0.30	6.60	1.32	0.78	6.12	0.36	0.42	1.86	5.40	0.60	23.77
Average	0.63	1.31	0.55	0.54	1.21	0.75	0.44	0.55	1.13	0.83	0.96
Small Farmers	7	21	13	6	21	4	10	12	21	1	116

Land sown (in acre)	7.5	52.75	13.25	6.5	49.75	3	7.25	14	38.5	1	193.5
%age	1.80	12.67	3.18	1.56	11.94	0.72	1.74	3.36	9.24	0.24	46.46
Average	1.07	2.51	1.02	1.08	2.37	0.75	0.73	1.17	1.83	1	1.67
Semi Medium Farmers	6	8	4	2	8	3	5	6	8	0	50
Land sown (in acre)	4.75	26.5	5.5	3.5	28	3	4.75	9	21	0	106
%age	1.14	6.36	1.32	0.84	6.72	0.72	1.14	2.16	5.04	0	25.45
Average	0.79	3.31	1.38	1.75	3.50	1	0.95	1.50	2.63	0	2.12
Medium farmers	1	1	1	1	1	1	1	1	1	0	9
Land sown (in acre)	1	4	1	2	5	1	1	2	1	0	18
%age	0.24	0.96	0.24	0.48	1.20	0.24	0.24	0.48	0.24	0	4.32
Average	1	4	1	2	5	1	1	2	1	0	2
Vaishali	6	44	21	19	44	13	18	37	44	14	260
Land sown (in acre)	5.75	92.75	21	19.5	88.75	11.75	14.5	37.5	68.75	17	377.25
%age	1.52	24.59	5.57	5.17	23.53	3.11	3.84	9.94	18.22	4.51	100
Average	0.96	2.11	1	1.03	2.02	0.9	0.81	1.01	1.56	1.21	1.45
Marginal Farmers	0	17	8	7	17	3	5	13	17	3	90
Land sown (in acre)	0	19.25	5.5	4.5	17.75	2	2.5	8.5	17.25	3	80.25
%age	0	5.10	1.46	1.19	4.71	0.53	0.66	2.25	4.57	0.80	21.27
Average	0	1.13	0.69	0.64	1.04	0.67	0.50	0.65	1.01	1	0.89
Small Farmers	4	19	9	9	19	6	8	17	19	7	117
Land sown (in acre)	2.75	45	10	8	41.5	6.25	5	19.5	32	6	176
%age	0.73	11.93	2.65	2.12	11	1.66	1.33	5.17	8.48	1.59	46.65
Average	0.69	2.37	1.11	0.89	2.18	1.04	0.63	1.15	1.68	0.86	1.50
Semi Medium Farmers	2	8	4	3	8	4	5	7	8	4	53
Land sown (in acre)	3	28.5	5.5	7	29.5	3.5	7	9.5	19.5	8	121
%age	0.80	7.55	1.46	1.86	7.82	0.93	1.86	2.52	5.17	2.12	32.07
Average	1.50	3.56	1.38	2.33	3.69	0.88	1.40	1.36	2.44	2	2.28

All	22	95	49	34	95	23	38	70	94	18	538
Land sown (in acre)	20.25	203.5	46.25	34.75	197	20.25	29.25	70.25	151.75	20.5	793.75
%age	2.55	25.64	5.83	4.38	24.82	2.55	3.69	8.85	19.12	2.58	100
Average age	0.92	2.14	0.94	1.02	2.07	0.88	0.77	1	1.61	1.14	1.48
Marginal Farmers	2	38	18	13	38	5	9	27	37	6	193
Land sown (in acre)	1.25	46.75	11	7.75	43.25	3.5	4.25	16.25	39.75	5.5	179.25
%age	0.16	5.89	1.39	0.98	5.45	0.44	0.54	2.05	5.01	0.69	22.58
Average	0.63	1.23	0.61	0.60	1.14	0.70	0.47	0.60	1.07	0.92	0.93
Small Farmers	11	40	22	15	40	10	18	29	40	8	233
Land sown (in acre)	10.25	97.75	23.25	14.5	91.25	9.25	12.25	33.5	70.5	7	369.5
%age	1.29	12.31	2.93	1.83	11.50	1.17	1.54	4.22	8.88	0.88	46.55
Average	0.93	2.44	1.06	0.97	2.28	0.93	0.68	1.16	1.76	0.88	1.59
Semi Medium Farmers	8	16	8	5	16	7	10	13	16	4	103
Land sown (in acre)	7.75	55	11	10.5	57.5	6.5	11.75	18.5	40.5	8	227
%age	0.98	6.93	1.39	1.32	7.24	0.82	1.48	2.33	5.10	1.01	28.60
Average	0.97	3.44	1.38	2.10	3.59	0.93	1.18	1.42	2.53	2	2.20
Medium farmers	1	1	1	1	1	1	1	1	1	0	9
Land sown (in acre)	1	4	1	2	5	1	1	2	1	0	18
%age	0.13	0.50	0.13	0.25	0.63	0.13	0.13	0.25	0.13	0	2.27
Average	1	4	1	2	5	1	1	2	1	0	2

Table 5.20: Farmer category and district wise cropping intensity

District/Category	Gross Area Sown	Net operated area	Cropping intensity
Muzaffarpur	416.5	184.5	2.26
Marginal Farmers	99	38.5	2.57
Small Farmers	193.5	81.5	2.37
Semi Medium Farmers	106	51.5	2.06
Medium farmers	18	13	1.38
Vaishali	377.25	160.75	2.35
Marginal Farmers	80.25	30.75	2.61
Small Farmers	176	75	2.35
Semi Medium Farmers	121	55	2.20
Total	793.75	345.25	2.30
Marginal Farmers	179.25	69.25	2.59
Small Farmers	369.5	156.5	2.36
Semi Medium Farmers	227	106.5	2.13
Medium farmers	18	13	1.38

Table 5.21: Farmer buyer category and district wise cropping intensity

District and farmer buyer category	Gross Area Sown	Net operated area	Cropping intensity
Muzaffarpur	416.5	184.5	2.26
Dehaat	254.5	117.25	2.17
Non Dehaat	162	67.25	2.41
Vaishali	377.25	160.75	2.35
Dehaat	230.5	100.5	2.29
Non Dehaat	146.75	60.25	2.44
Total	793.75	345.25	2.30
Dehaat	485	217.75	2.23
Non Dehaat	308.75	127.5	2.42

All farmers purchased seeds for the Rabi and Kharif crops though about half of farmers could manage it from their own sources for *zaid* crop and of those, marginal farmers were more than others (table 5.22). In wheat and paddy, all farmers had bought seeds from the market in both districts and across Dehaat and non-Dehaat categories. But, in case of *zaid moong*, only about 51% had purchased seeds and it was more of the Dehaat farmers who had bought it than the non-Dehaat. Across districts, it was more in Vaishali and that too, more of Dehaat buyers, almost all of whom had bought whereas only a small percentage of the non-Dehaat

(22%) had done so. Chemical fertilisers were also widely used by all Dehaat farmers and all but 8% of the non-Dehaat farmers across crop seasons (tables 5.23). A somewhat higher proportion of Dehaat farmers reported buying biofertilisers than their non-Dehaat counterparts, which went upto 8% in Rabi season (table 5.24 and 5.25). Micronutrients were equally used by both categories upto 25% of farmers in *Kharif* and 35-50% in *Rabi* season (table 5.26 and 5.27). The PGPs were used only by Dehaat buyers ranging from 6-14% across seasons (table 5.28).

Table 5.22: Distribution of farmers by purchase of seeds during different seasons

Season and crop	***Kharif* Paddy**		***Rabi* Wheat**		***Zaid Moong***	
Seed purchase > Distt and category	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	51	0	51	0	21	29
%age	100	0	100	0	42	58
Marginal Farmers	21	0	21	0	6	14
%age	41.18	0.00	41.18	0.00	12.00	28.00
Small Farmers	21	0	21	0	11	10
%age	41.18	0.00	41.18	0.00	22.00	20.00
Semi Medium Farmers	8	0	8	0	3	5
%age	15.69	0.00	15.69	0.00	6.00	10.00
Medium farmers	1	0	1	0	1	0
%age	1.96	0.00	1.96	0.00	2.00	0.00
Vaishali	44	0	44	0	27	17
%age	100.00	0.00	100.00	0.00	61.36	38.64
Marginal Farmers	17	0	17	0	10	7
%age	38.64	0.00	38.64	0.00	22.73	15.91
Small Farmers	19	0	19	0	11	8
%age	43.18	0.00	43.18	0.00	25.00	18.18
Semi Medium Farmers	8	0	8	0	6	2
%age	18.18	0.00	18.18	0.00	13.64	4.55
Medium farmers	0	0	0	0	0	0
%age	0.00	0.00	0.00	0.00	0.00	0.00
All	95	0	95	0	48	46
%age	100.00	0.00	100.00	0.00	51.06	48.94
Marginal Farmers	38	0	38	0	16	21
%age	40.00	0.00	40.00	0.00	17.02	22.34
Small Farmers	40	0	40	0	22	18
%age	42.11	0.00	42.11	0.00	23.40	19.15
Semi Medium Farmers	16	0	16	0	9	7
%age	16.84	0.00	16.84	0.00	9.57	7.45
Medium farmers	1	0	1	0	1	0
%age	1.05	0.00	1.05	0.00	1.06	0.00

About 92% of the farmers purchased chemical fertilizers for *Rabi* and *Kharif* crops (table 5.23) whereas in case of *zaid* crops it was a bit lower (89%). Relatively speaking, purchase of chemical fertilizers was more prevalent among Muzaffarpur farmers. Those how purchased fertilizers, more of them were small holders followed by marginal and semi-medium farmers in both the seasons across both the districts.

Table 5.23: Distribution of farmers for purchase of chemical fertilizer by season, crop and category

Season and crop	***Kharif* Paddy**		***Rabi* Wheat**		***Zaid Moong***	
Fertiliser bought > District, and buyer category	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	50	1	50	1	49	1
%age	98.04	1.96	98.04	1.96	98	2
Dehaat Buyer	30	0	30	0	29	0
%age	58.82	0	58.82	0	58	0
Non Dehaat Buyer	20	1	20	1	20	1
%age	39.22	1.96	39.22	1.96	40	2
Vaishali	42	2	42	2	40	4
%age	95.45	4.55	95.45	4.55	90.91	9.09
Dehaat Buyer	26	0	26	0	24	2
%age	59.09	0	59.09	0	54.55	4.55
Non Dehaat Buyer	16	2	16	2	16	2
%age	36.36	4.55	36.36	4.55	36.36	4.55
All	92	3	92	3	89	5
%age	96.84	3.16	96.84	3.16	94.68	5.32
Dehaat Buyer	56	0	56	0	53	2
%age	58.95	0	58.95	0	56.38	2.13
Non Dehaat Buyer	36	3	36	3	36	3
%age	37.89	3.16	37.89	3.16	38.30	3.19

Table 5.24: Distribution of farmers by purchase of chemical fertilizer by season and category

Season and Crop >	***Kharif* Paddy**		***Rabi* Wheat**		***Zaid Moong***	
Input purchased > Category and district	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	50	1	50	1	49	1
%age	98	2	98	2	98	2
Marginal Farmers	20	1	20	1	2	18
%age	39.22	1.96	39.22	1.96	4.00	36.00
Small Farmers	21	0	21	0	21	0
%age	41.18	0.00	41.18	0.00	42.00	0.00
Semi Medium Farmers	8	0	8	0	8	0
%age	15.69	0.00	15.69	0.00	16.00	0.00
Medium farmers	1	0	1	1	1	0
%age	1.96	0.00	1.96	1.96	2.00	0.00
Vaishali	42	2	42	2	40	4
%age	95.45	4.55	95.45	4.55	90.91	9.09
Marginal Farmers	15	2	15	2	15	2
%age	34.09	4.55	34.09	4.55	34.09	4.55
Small Farmers	19	0	19	0	18	1
%age	43.18	0.00	43.18	0.00	40.91	2.27
Semi Medium Farmers	8	0	8	0	7	1
%age	18.18	0.00	18.18	0.00	15.91	2.27
Medium farmers	0	0	0	0	0	0
%age	0.00	0.00	0.00	0.00	0.00	0.00
All	92	3	92	3	89	5
%age	96.84	3.16	96.84	3.16	94.68	5.32
Marginal Farmers	35	3	35	3	17	20
%age	36.84	3.16	36.84	3.16	18.09	21.28
Small Farmers	40	0	40	0	39	1
%age	42.11	0.00	42.11	0.00	41.49	1.06
Semi Medium Farmers	16	0	16	0	15	1
%age	16.84	0.00	16.84	0.00	15.96	1.06
Medium farmers	1	0	1	1	1	0
%age	1.05	0.00	1.05	1.05	1.06	0.00

Only 13% and 19% farmers bought bio-fertilizers for *Kharif* and *Rabi* seasons respectively (table 5.26). In Muzaffarpur, farmers used bio-fertilizers more for Rabi crops whereas it was equal in Vaishali. Only 6% farmers used bio-fertilizers for *zaid* crops and most of them were found in Vaishali. Landholding had an effect on purchase of bio-fertilizers in Vaishali only.

Table 5.25: Distribution of farmers by category and crops for purchase of bio-fertilizer

Season and Crop >	**Kharif Paddy**		**Rabi Wheat**		**Zaid *Moong***	
Input purchased > Category and district	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	**4**	**47**	**10**	**41**	**1**	**49**
%age	8	92	20	80	2	98
Marginal Farmers	2	19	3	18	1	19
%age	3.92	37.25	5.88	35.29	2.00	38.00
Small Farmers	2	19	6	15	0	21
%age	3.92	37.25	11.76	29.41	0.00	42.00
Semi Medium Farmers	0	8	1	7	0	8
%age	0.00	15.69	1.96	13.73	0.00	16.00
Medium farmers		1		1		1
%age	0.00	1.96	0.00	1.96	0.00	2.00
Vaishali	**9**	**35**	**9**	**35**	**5**	**39**
%age	20.45	79.55	20.45	79.55	11.36	88.64
Marginal Farmers	3	14	3	14	2	15
%age	6.82	31.82	6.82	31.82	4.55	34.09
Small Farmers	5	14	5	14	2	17
%age	11.36	31.82	11.36	31.82	4.55	38.64
Semi Medium Farmers	1	7	1	7	1	7
%age	2.27	15.91	2.27	15.91	2.27	15.91
Medium farmers	0	0	0	0	0	0
%age	0.00	0.00	0.00	0.00	0.00	0.00
All	**13**	**82**	**19**	**76**	**6**	**88**
%age	13.68	86.32	20.00	80.00	6.38	93.62
Marginal Farmers	**5**	**33**	**6**	**32**	**3**	**34**
%age	5.26	34.74	6.32	33.68	3.19	36.17
Small Farmers	**7**	**33**	**11**	**29**	**2**	**38**
%age	7.37	34.74	11.58	30.53	2.13	40.43
Semi Medium Farmers	**1**	**15**	**2**	**14**	**1**	**15**
%age	1.05	15.79	2.11	14.74	1.06	15.96
Medium farmers	**0**	**1**	**0**	**1**	**0**	**1**
%age	0.00	1.05	0.00	1.05	0.00	1.06

Table 5.26: Distribution of farmers for purchase of biofertilizer by season, crop and category

Season and crop	Kharif Paddy		Rabi Wheat		Zaid *Moong*	
Biofert bought > Distt, and category	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	4	47	10	41	1	49
%age	7.84	92.16	19.61	80.39	2	98
Dehaat Buyer	2	28	8	22	1	28
%age	3.92	54.90	15.69	43.14	2	56
Non Dehaat Buyer	2	19	2	19	0	21
%age	3.92	37.25	3.92	37.25	0	42
Vaishali	9	35	9	35	5	39
%age	20.45	79.55	20.45	79.55	11.36	88.64
Dehaat Buyer	6	20	8	18	5	21
%age	13.64	45.45	18.18	40.91	11.36	47.73
Non Dehaat Buyer	3	15	1	17	0	18
%age	6.82	34.09	2.27	38.64	0	40.91
All	13	82	19	76	6	88
%age	13.68	86.32	20	80	6.38	93.62
Dehaat Buyer	8	48	16	40	6	49
%age	8.42	50.53	16.84	42.11	6.38	52.13
Non Dehaat Buyer	5	34	3	36	0	39
%age	5.26	35.79	3.16	37.89	0	41.49

Table 5.27: Distribution of farmers for purchase of micronutrients by season, crop and buyer category

Season and crop	Kharif Paddy		Rabi Wheat		Zaid *Moong*	
Micronutrients bought > District and buyer category	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	25	26	42	9	11	39
%age	49.02	50.98	82.35	17.65	22	78
Dehaat Buyer	12	18	24	6	5	24
%age	23.53	35.29	47.06	11.76	10	48
Non Dehaat Buyer	13	8	18	3	6	15
%age	25.49	15.69	35.29	5.88	12	30
Vaishali	23	21	38	6	10	34
%age	52.27	47.73	86.36	13.64	22.73	77.27
Dehaat Buyer	13	13	22	4	5	21
%age	29.55	29.55	50	9.09	11.36	47.73
Non Dehaat Buyer	10	8	16	2	5	13
%age	22.73	18.18	36.36	4.55	11.36	29.55
All	48	47	80	15	21	73
%age	50.53	49.47	84.21	15.79	22.34	77.66
Dehaat Buyer	25	31	46	10	10	45
%age	26.32	32.63	48.42	10.53	10.64	47.87
Non Dehaat Buyer	23	16	34	5	11	28
%age	24.21	16.84	35.79	5.26	11.70	29.79

Purchase of micronutrients was more common for wheat (84%) than for paddy (50%) and this trend is similar across both the districts (table 5.28). About 20% farmers (overall and in both districts), purchased micro-nutrients for *zaid* crops. Small farmers seemed more interested in these inputs followed by marginal and semi-medium farmers (overall and in both districts).

Table 5.28: Distribution of farmers by category for purchase of micronutrients

Season and Crop >	***Kharif* Paddy**		***Rabi* Wheat**		**Zaid *Moong***	
Input purchased > District and category	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	25	26	42	9	11	39
%age	49	51	82	18	22	78
Marginal Farmers	8	13	18	3	2	18
%age	15.69	25.49	35.29	5.88	4.00	36.00
Small Farmers	11	10	18	3	5	16
%age	21.57	19.61	35.29	5.88	10.00	32.00
Semi Medium Farmers	6	2	6	2	4	4
%age	11.76	3.92	11.76	3.92	8.00	8.00
Medium farmers	0	1	0	1	0	1
%age	0.00	1.96	0.00	1.96	0.00	2.00
Vaishali	23	21	38	6	10	34
%age	52.27	47.73	86.36	13.64	22.73	77.27
Marginal Farmers	6	11	15	2	3	14
%age	13.64	25.00	34.09	4.55	6.82	31.82
Small Farmers	11	8	16	3	6	13
%age	25.00	18.18	36.36	6.82	13.64	29.55
Semi Medium Farmers	6	2	7	1	1	7
%age	13.64	4.55	15.91	2.27	2.27	15.91
All	48	47	80	15	21	73
%age	50.53	49.47	84.21	15.79	22.34	77.66
Marginal Farmers	14	24	33	5	5	32
%age	14.74	25.26	34.74	5.26	5.32	34.04
Small Farmers	22	18	34	6	11	29
%age	23.16	18.95	35.79	6.32	11.70	30.85
Semi Medium Farmers	12	4	13	3	5	11
%age	12.63	4.21	13.68	3.16	5.32	11.70
Medium farmers	0	1	0	1	0	1
%age	0.00	1.05	0.00	1.05	0.00	1.06

Table 5.29: Distribution of farmers for purchase of PGPs by season, crop and category

Season and crop	***Kharif* Paddy**		***Rabi* Wheat**		***Zaid* Moong**	
PGPs bought > distt and category	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	0	51	5	46	0	50
%age	0	100	9.80	90.20	0	100
Dehaat Buyer	0	30	5	25	0	29
%age	0	58.82	9.80	49.02	0	58
Non Dehaat Buyer	0	21	0	21	0	21
%age	0	41.18	0	41.18	0	42
Vaishali	6	38	8	36	4	40
%age	13.64	86.36	18.18	81.82	9.09	90.91
Dehaat Buyer	6	20	8	18	4	22
%age	13.64	45.45	18.18	40.91	9.09	50
Non Dehaat Buyer	0	18	0	18	0	18
%age	0	40.91	0	40.91	0	40.91
All	6	89	13	82	4	90
%age	6.32	93.68	13.68	86.32	4.26	95.74
Dehaat Buyer	6	50	13	43	4	51
%age	6.32	52.63	13.68	45.26	4.26	54.26
Non Dehaat Buyer	0	39	0	39	0	39
%age	0	41.05	0	41.05	0	41.49

Relatively, in the Kharif season, the use of chemical pesticides was more prevalent (78%) when compared in the Rabi season (58%). In the Rabi season, a higher percentage of farmers (80% and 75%) purchased chemical pesticides in Muzzafarpur and Vaishali respectively than in the Kharif season (67% and 48%) across both the districts (table 5.29). A higher number of Dehaat farmers bought chemical pesticides in all seasons across both the districts except in case of *Zaid Moong* in Muzaffarpur where an equal number of Dehaat and Non-Dehaat farmers were inclined towards the use of chemical pesticides. Almost similar trends were found in case of purchase of weedicides/herbicides (table 5.30).

Table 5.30: Distribution of farmers for purchase of chemical pesticides by season, crop and category

Season and crop	*Kharif* Paddy		*Rabi* Wheat		*Zaid Moong*	
Pesticide bought > distt and category	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	34	17	41	10	8	42
%age	66.67	33.33	80.39	19.61	16	84
Dehaat Buyer	20	10	22	8	4	25
%age	39.22	19.61	43.14	15.69	8	50
Non Dehaat Buyer	14	7	19	2	4	17
%age	27.45	13.73	37.25	3.92	8	34
Vaishali	21	23	33	11	10	34
%age	47.73	52.27	75	25	22.73	77.27
Dehaat Buyer	11	15	17	9	7	19
%age	25	34.09	38.64	20.45	15.91	43.18
Non Dehaat Buyer	10	8	16	2	3	15
%age	22.73	18.18	36.36	4.55	6.82	34.09
All	55	40	74	21	18	76
%age	57.89	42.11	77.89	22.11	19.15	80.85
Dehaat Buyer	31	25	39	17	11	44
%age	32.63	26.32	41.05	17.89	11.70	46.81
Non Dehaat Buyer	24	15	35	4	7	32
%age	25.26	15.79	36.84	4.21	7.45	34.04

Table 5.31: Distribution of farmers for purchase of weedicide/herbicides by season, crop and category

Season and Crop >	*Kharif* Paddy		*Rabi* Wheat		*Zaid Moong*	
Weedicide/herbicide purchase> Distt and parameters	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	34	17	40	11	0	50
%age	66.67	33.33	78.43	21.57	0	100
Dehaat Buyer	22	8	25	5	0	29
%age	43.14	15.69	49.02	9.80	0	58
Non Dehaat Buyer	12	9	15	6	0	21
%age	23.53	17.65	29.41	11.76	0	42
Vaishali	30	14	32	12	4	40
%age	68.18	31.82	72.73	27.27	9.09	90.91
Dehaat Buyer	21	5	16	10	4	22
%age	47.73	11.36	36.36	22.73	9.09	50
Non Dehaat Buyer	9	9	16	2	0	18
%age	20.45	20.45	36.36	4.55	0	40.91
All	64	31	72	23	4	90
%age	67.37	32.63	75.79	24.21	4.26	95.74
Dehaat Buyer	43	13	41	15	4	51
%age	45.26	13.68	43.16	15.79	4.26	54.26
Non Dehaat Buyer	21	18	31	8	0	39
%age	22.11	18.95	32.63	8.42	0	41.49

Compared with pesticides and weedicides/herbicides, very low proportion of farmers purchased fungicides especially in the Kharif season; however, in the Rabi season, about 39% farmers used fungicides, probably due to the wheat crop being more prone to fungus than paddy (table 5.31). In the Kharif season, a higher number of farmers (88%) refrained from fungicide usage in Muzaffarpur than in Vaishali (77%) though the corresponding figures for the Rabi season were almost comparable. Of those farmers who used fungicides, more of them were Dehaat farmers; with no non-Dehaat farmer in Vaishali purchasing any fungicide. Similarly, only 10-15% of the farmers (combined) applied bio-pesticides in both the seasons across both districts (table 5.32). Interestingly, all non-Dehaat farmers for all crops across both the districts refrained from using bio-pesticides.

Table 5.32: Distribution of farmer for purchase of fungicides by season, crop and category

Season and Crop >	***Kharif* Paddy**		***Rabi* Wheat**		***Zaid* Moong**	
Fungicide purchases > Distt, farmer category and parameter	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	6	45	20	31	5	45
%age	11.76	88.24	39.22	60.78	10	90
Dehaat Buyer	4	26	14	16	4	25
%age	7.84	50.98	27.45	31.37	8	50
Non Dehaat Buyer	2	19	6	15	1	20
%age	3.92	37.25	11.76	29.41	2	40
Vaishali	10	34	17	27	15	29
%age	22.73	77.27	38.64	61.36	34.09	65.91
Dehaat Buyer	10	16	14	12	15	11
%age	22.73	36.36	31.82	27.27	34.09	25
Non Dehaat Buyer	0	18	3	15	0	18
%age	0	40.91	6.82	34.09	0	40.91
All	16	79	37	58	20	74
%age	16.84	83.16	38.95	61.05	21.28	78.72
Dehaat Buyer	14	42	28	28	19	36
%age	14.74	44.21	29.47	29.47	20.21	38.30
Non Dehaat Buyer	2	37	9	30	1	38
%age	2.11	38.95	9.47	31.58	1.06	40.43

Table 5.33: Distribution of farmers for purchase of bio-pesticides by season, crop and category

Season and crop	*Kharif* Paddy		*Rabi* Wheat		Zaid *Moong*	
Biopes bought > distt and category	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**	**Purchased**	**Not purchased**
Muzaffarpur	2	49	4	47	0	50
%age	3.92	96.08	7.84	92.16	0	100
Dehaat Buyer	2	28	4	26	0	29
%age	3.92	54.90	7.84	50.98	0	58
Non Dehaat Buyer	0	21	0	21	0	21
%age	0	41.18	0	41.18	0	42
Vaishali	8	36	10	34	8	36
%age	18.18	81.82	22.73	77.27	18.18	81.82
Dehaat Buyer	8	18	10	16	8	18
%age	18.18	40.91	22.73	36.36	18.18	40.91
Non Dehaat Buyer	0	18	0	18	0	18
%age	0	40.91	0	40.91	0	40.91
All	10	85	14	81	8	86
%age	10.53	89.47	14.74	85.26	8.51	91.49
Dehaat Buyer	10	46	14	42	8	47
%age	10.53	48.42	14.74	44.21	8.51	50
Non Dehaat Buyer	0	39	0	39	0	39
%age	0	41.05	0	41.05	0	41.49

More than half of the farmers (combined) bought farm inputs on credit, however, this custom was a bit more common among farmers in Vaishali than those in Muzaffarpur (table 5.33). Dehaat farmers were more interested in using cash sources than non-Dehaat farmers in both the districts with an exception of Vaishali where Dehaat farmers relied more on credit than cash. About 60% of Dehaat farmers bought using both cash and credit and most of them were marginal and small farmers (table 5.34). Almost an equal number of farmers in both the districts bought on cash.

Table 5.34: Distribution of farmers by terms of purchase and category

Terms of purchase> District, type of buyer and %age	Cash	Both cash and credit
Muzaffarpur	24	27
%age	47.06	52.94
Dehaat Buyer	12	18
%age	23.53	35.29
Non Dehaat Buyer	12	9
%age	23.53	17.65
Vaishali	18	26
%age	40.91	59.09
Dehaat Buyer	10	16
%age	22.73	36.36
Non Dehaat Buyer	8	10
%age	18.18	22.73
All	42	53
%age	44.21	55.79
Dehaat Buyer	22	34
%age	23.16	35.79
Non Dehaat Buyer	20	19
%age	21.05	20

Only 10% of the farmers faced shortage of agri-inputs at Dehaat and the major shortage was of seeds (table 5.35). However, the instances of shortage were relatively more in Vaishali than in Muzaffarpur. More than 80% of the Dehaat farmers in both the districts were aware of company behind Dehaat (table 5.36). Small farmers could be ranked first regarding this awareness followed by marginal and semi-medium farmers across both the districts. Only 10% of the Dehaat farmers (combined) faced a shortage of agri-inputs. However, this figure was double in case of Vaishali (19%) and most of farmers facing this shortage were marginal farmers and the reason they mentioned was non-availability of specific variety of input.

Table 5.35: Distribution of Dehaat buyers by terms of purchase and category

Terms of purchase> Distt, category and %age	Cash	Both cash and credit
Muzaffarpur	12	18
%age	40	60
Marginal Farmers	6	6
%age	20	20
Small Farmers	3	9
%age	10	30
Semi Medium Farmers	2	3
%age	6.67	10
Medium farmers	1	0
%age	3.33	0
Vaishali	10	16
%age	38.46	61.54
Marginal Farmers	4	5
%age	15.38	19.23
Small Farmers	5	6
%age	19.23	23.08
Semi Medium Farmers	1	5
%age	3.85	19.23
Medium farmers	0	0
%age	0	0
All	22	34
%age	39.29	60.71
Marginal Farmers	10	11
%age	17.86	19.64
Small Farmers	8	15
%age	14.29	26.79
Semi Medium Farmers	3	8
%age	5.36	14.29
Medium farmers	1	0
%age	1.79	0

Table 5.36: Distribution of farmers by category for shortage of agri-input at Dehaat

District , category and %age	Faced any shortage (seeds)	Not faced any shortage	Reason: Seasonal Shortage (seeds)	Specific variety not available
Muzaffarpur	1	29	1	0
%age	3.33	96.67	100	0
Vaishali	5	21	3	2
%age	19.23	80.77	60	40
All	6	50	4	2
%age	10.71	89.29	66.67	33.33

Table 5.37 Distribution of Dehaat buyers by category for shortage of agri-input at Dehaat

Shortage and type> District & farmer category	Faced any shortage of agri-input (seeds)	Not faced any shortage of agri-input	Reason: Seasonal Shortage (seeds)	Specific variety not available
Muzaffarpur	1	29	1	0
%age	3.33	96.67	100	0
Marginal Farmers	0	12	0	0
%age	0	40	0	0
Small Farmers	0	12	0	0
%age	0	40	0	0
Semi Medium Farmers	1	4	1	0
%age	3.33	13.33	100	0
Medium farmers	0	1	0	0
%age	0	3.33	0	0
Vaishali	5	21	3	2
%age	19.23	80.77	60	40
Marginal Farmers	3	6	1	2
%age	11.54	23.08	20	40
Small Farmers	1	10	1	0
%age	3.85	38.46	20	0
Semi Medium Farmers	1	5	1	0
%age	3.85	19.23	20	0
Medium farmers	0	0	0	0
%age	0	0	0	0
All	6	50	4	2
%age	10.71	89.29	66.67	33.33
Marginal Farmers	3	18	1	2
%age	5.36	32.14	16.67	33.33
Small Farmers	1	22	1	0
%age	1.79	39.29	16.67	0
Semi Medium Farmers	2	9	2	0
%age	3.57	16.07	33.33	0
Medium farmers	0	1	0	0
%age	0	1.79	0	0

82% of the non-Dehaat farmers knew about Dehaat and of those who knew, 46% visited the Dehaat outlets (table 5.37). However, this prevalence was higher among non-Dehaat farmers in Vaishali. Among those who knew about Dehaat, the most frequent were marginal farmers followed by small and medium holders in both the districts. However, of those who visited the Dehaat, small holders were more prominent than marginal and semi-medium holders across both districts (table 5.38). Of those who visited, about one-third farmers found the Dehaat products as spurious and this observation was higher among Vaishali farmers than

Muzaffarpur ones. About 10-16% farmers across both the districts, could not find the products they visited for (table 5.39). About 88% farmers were aware of company behind Dehaat; however, the level of this awareness was a bit higher in Vaishali than in Muzaffarpur (table 5.38). Each farmer was visited at least three times in a crop season by Dehaat staff (table 5.39).

Table 5.38: Distribution of Non-Dehaat farmers by awareness about Dehaat

Awareness, visit and reasons> Category and district	**Aware**		**Visited**		**Reason for not buying from Dehaat**	
Response	Yes	No	Yes	No	Spurious products	Products not available timely
Muzaffarpur	15	6	8	7	6	2
%age	71.43	28.57	38.10	33.33	28.57	9.52
Marginal Farmers	6	3	2	4	2	0
%age	28.57	14.29	9.52	19.05	9.52	0
Small Farmers	5	2	4	1	2	2
%age	23.81	9.52	19.05	4.76	9.52	9.52
Semi Medium Farmers	4	1	2	2	2	0
%age	19.05	4.76	9.52	9.52	9.52	0
Vaishali	17	1	10	7	7	3
%age	94.44	5.56	55.56	38.89	38.89	16.67
Marginal Farmers	8	0	3	5	2	1
%age	44.44	0	16.67	27.78	11.11	5.56
Small Farmers	7	1	5	2	3	2
%age	38.89	5.56	27.78	11.11	16.67	11.11
Semi Medium Farmers	2	0	2	0	2	0
%age	11.11	0	11.11	0	11.11	0
All	32	7	18	14	13	5
%age	82.05	17.95	46.15	35.90	33.33	12.82
Marginal Farmers	14	3	5	9	4	1
%age	35.90	7.69	12.82	23.08	10.26	2.56
Small Farmers	12	3	9	3	5	4
%age	30.77	7.69	23.08	7.69	12.82	10.26
Semi Medium Farmers	6	1	4	2	4	0
%age	15.38	2.56	10.26	5.13	10.26	0

Table 5.39 Distribution of Dehaat Buyers by category for awareness about company behind Dehaat

Distt, farmer category and %age	Aware	Not aware
Muzaffarpur	25	5
%age	83.33	16.67
Marginal Farmers	9	3
%age	30	10
Small Farmers	12	0
%age	40	0
Semi Medium Farmers	3	2
%age	10	6.67
Medium farmers	1	0
%age	3.33	0
Vaishali	24	2
%age	92.31	7.69
Marginal Farmers	7	2
%age	26.92	7.69
Small Farmers	11	0
%age	42.31	0
Semi Medium Farmers	6	0
%age	23.08	0
Medium farmers	0	0
%age	0	0
All	49	7
%age	87.50	12.50
Marginal Farmers	16	5
%age	28.57	8.93
Small Farmers	23	0
%age	41.07	0
Semi Medium Farmers	9	2
%age	16.07	3.57
Medium farmers	1	0
%age	1.79	0

Table 5.40: Distribution of farmers by average no. of visits by Dehaat staff in a crop season

District	Average No. of visits by K3 staff	Total No. of farmers
Muzaffarpur	3.03	30
Vaishali	3.73	26
All	3.36	56

About 43% of the farmers had their soil tested (table 5. 40). Relatively, Dehaat farmers were found to be more inclined towards soil testing across both the districts. About 32% farmers in Muzaffarpur got their soils tested whereas the corresponding figure for Vaishali was 57%. Dehaat, as a soil testing agency, was more preferred destination in Vaishali than in Mazaffarpur. Of those who got their soils tested in Muzaffarpur, only 8% found it beneficial whereas this figure was 18% in Vaishali. Probably, Dehaat soil testing system was more credible than that of a government department. About 40% of the farmers had a membership of a Dehaat farmer group and a large proportion of that was composed of marginal and small farmers (table 5.41). More than three times of farmers in Vaishali (61%) had this membership when compared to Muzaffarpur (20%). However, in both the districts, semi-medium farmers were least interested in Dehaat farmer group membership. More of marginal farmers in Muzaffarpur were member of this group whereas in Vaishali, small farmers had a higher membership rate**.**

Table 5.41: Distribution of farmers by category on responses on soil testing

District and buyer category	Yes	No	By Dehaat	Benefitted	By Govt. Dept	Benefitted	Not benefitted
Muzaffarpur	16	35	4	4	12	4	8
%age	31.37	68.63	7.84	7.84	23.53	7.84	15.69
Dehaat Buyer	11	19	4	4	7	2	5
%age	21.57	37.25	7.84	7.84	13.73	3.92	9.80
Non Dehaat Buyer	5	16	0	0	5	2	3
%age	9.80	31.37	0.00	0.00	9.80	3.92	5.88
Vaishali	25	19	15	15	10	8	2
%age	56.82	43.18	34.09	34.09	22.73	18.18	4.55
Dehaat Buyer	20	6	15	15	5	3	2
%age	45.45	13.64	34.09	34.09	11.36	6.82	4.55
Non Dehaat Buyer	5	13	0	0	5	5	0
%age	11.36	29.55	0.00	0.00	11.36	11.36	0.00
Overall	41	54	19	19	22	12	10
%age	43.16	56.84	20.00	20.00	23.16	12.63	10.53
Dehaat Buyer	31	25	19	19	12	5	7
%age	32.63	26.32	20.00	20.00	12.63	5.26	7.37
Non Dehaat Buyer	10	29	0	0	10	7	3
%age	10.53	30.53	0.00	0.00	10.53	7.37	3.16

Table 5.42: Distribution of Farmers by category for membership of Dehaat farmer group

Membership of Dehaat group> District and farmer category	Yes	No	Average no of meetings/year
Muzaffarpur	6	24	12
%age	20	80	
Marginal Farmers	3	9	12
%age	10	30	
Small Farmers	2	10	12
%age	6.67	33.33	
Semi Medium Farmers	1	4	12
%age	3.33	13.33	
Medium farmers	0	1	0
%age	0.00	3.33	
Vaishali	16	10	12
%age	61.54	38.46	
Marginal Farmers	4	5	12
%age	15.38	19.23	
Small Farmers	8	3	12
%age	30.77	11.54	
Semi Medium Farmers	4	2	12
%age	15.38	7.69	
Medium farmers	0	0	0
%age	0.00	0.00	
All	22	34	12
%age	39.29	60.71	
Marginal Farmers	7	14	12
%age	12.50	25.00	
Small Farmers	10	13	12
%age	17.86	23.21	
Semi Medium Farmers	5	6	12
%age	8.93	10.71	
Medium farmers	0	1	12
%age	0.00	1.79	

Very few farmers (9%) reported that they could cut the cost of cultivation through the intervention of Dehaat extension (table 5.42). The instances were a bit more common in Muzaffarpur than in Vaishali. However, the landholding size had no significant effect on it.

Table 5.43: Distribution of Dehaat farmers by decrease in cost of production due to Dehaat extension

Cost of production decline and magnitude> District, category and %age	Yes	No	Decreased by 0-15%	Decreased by 15-30%
Muzaffarpur	1	29	1	0
%age	3.33	96.67		
Marginal Farmers	1	11	1	0
%age	3.33	36.67		
Small Farmers	0	12	0	0
%age	0.00	40.00		
Semi Medium Farmers	0	5	0	0
%age	0.00	16.67		
Medium farmers	0	1	0	0
%age	0.00	3.33		
Vaishali	4	22	2	2
%age	15.38	84.62		
Marginal Farmers	1	8	0	1
%age	3.85	30.77		
Small Farmers	2	9	1	1
%age	7.69	34.62		
Semi Medium Farmers	1	5	1	0
%age	3.85	19.23		
Medium farmers	0	0	0	0
%age	0.00	0.00		
All	5	51	3	2
%age	8.93	91.07		
Marginal Farmers	2	19	1	1
%age	3.57	33.93		
Small Farmers	2	21	1	1
%age	3.57	37.50		
Semi Medium Farmers	1	10	1	0
%age	1.79	17.86		
Medium farmers	0	1	0	0
%age	0.00	1.79		

Of those, who reported reduction of cost of cultivation in Muzaffarpur, all farmers cited "proper utilization of resources" as a reason whereas, as a compete contradiction, everyone in Vaishali attributed it to use of new techniques (table 5.43). Again, size of landholding did not play a major role in reducing the costs.

Table 5.44: Distribution of Dehaat farmers by category for reduction in cost of production and reasons thereof

Decline in cost of production and reasons> District and category	Yes	No	Proper utilisation of resources	New techniques
Muzaffarpur	1	29	1	0
%age	3.33	96.67		
Marginal Farmers	1	11	1	0
%age	3.33	36.67		
Small Farmers	0	12	0	0
%age	0.00	40.00		
Semi Medium Farmers	0	5	0	0
%age	0.00	16.67		
Medium farmers	0	1	0	0
%age	0.00	3.33		
Vaishali	4	22	0	4
%age	15.38	84.62		
Marginal Farmers	1	8	0	1
%age	3.85	30.77		
Small Farmers	2	9	0	2
% age	7.69	34.62		
Semi Medium Farmers	1	5	0	1
%age	3.85	19.23		
Medium farmers	0	0	0	0
%age	0.00	0.00		
Overall	5	51	1	4
%age	8.93	91.07		
Marginal Farmers	2	19	1	1
%age	3.57	33.93		
Small Farmers	2	21	0	2
%age	3.57	37.50		
Semi Medium Farmers	1	10	0	1
%age	1.79	17.86		
Medium farmers	0	1	0	0
%age	0.00	1.79		

More than 92% farmers reported an increase in yields (table 5.44) though this number was a bit lower in Muzaffarpur (87%) when compared to Vaishali where all farmers noticed an increase. In most cases, this increase was upto 15% and those who reported an increase in yields between 15-30%, were located in Vaishali only. The prevalence of this phenomenon

was more common among marginal and small holders compared to semi-medium and medium farmers.

Table 5.45: Distribution of Dehaat farmers by category for response on increase in yield

Increase in yield and magnitude> District, category and %age	Yes	No	Increased by 0-15%	Increased by 15-30%
Muzaffarpur	26	4	26	0
%age	86.67	13.33		
Marginal Farmers	11	1	11	0
%age	36.67	3.33		
Small Farmers	11	1	11	0
%age	36.67	3.33		
Semi Medium Farmers	4	1	4	0
%age	13.33	3.33		
Medium farmers	1	0	1	0
%age	3.33	0.00		
Vaishali	26	0	22	4
%age	100.00	0.00		
Marginal Farmers	9	0	9	0
%age	34.62	0.00		
Small Farmers	11	0	9	2
%age	42.31	0.00		
Semi Medium Farmers	6	0	4	2
%age	23.08	0.00		
Medium farmers	0	0	0	0
%age	0.00	0.00		
All	52	4	48	4
%age	92.86	7.14		
Marginal Farmers	20	1	20	0
%age	35.71	1.79		
Small Farmers	22	1	20	2
%age	39.29	1.79		
Semi Medium Farmers	10	1	8	2
%age	17.86	1.79		
Medium farmers	1	0	1	0
%age	1.79	0.00		

About one-fifth of the farmers in both the districts confirmed that Dehaat could help them in crop selection and this help worked more in case of Kharif crop selection (table 5.45). Smallholders (9%) could benefit more from this advice than marginal and semi-medium farmers (5%) though the level of dissemination varied across districts as marginal and

smallholders had benefited equally in Vaishali. During both the seasons and across both the district, more farmers took this help in the last season than this season.

Table 5.46: Distribution of Dehaat buyers by category for their perception on help by Dehaat in crop selection

Perception on crop selection help by season> Distt and category	Yes	No	Rabi Crop Grown	Average area grown (in Acre)	This Season	Average area grown (in Acre)	Last Season	Average area grown (in Acre)	Kharif Crop Grown	Average area grown (in Acre)	This Season	Average area grown (in Acre)	Last Season	Average area grown (in Acre)
Muzaffarpur	6	24	1	2	0	0	1	2	5	1.64	2	1.75	3	1.56
%age	20	80	3.33		0		3.33		16.67		6.67		10	
Marginal Farmers	1	11	0	0	0	0	0	0	1	1.5	0	0	1	1.5
%age	3.33	36.67	0		0		0		3.33		0		3.33	
Small Farmers	3	9	1	2	0	0	1	2	2	1.75	2	1.75	0	0
%age	10	30	3.33		0		3.33		6.67		6.67		0	
Semi Medium Farmers	2	3	0	0	0	0	0	0	2	1.6	0	0	2	1.6
%age	6.67	10	0		0		0		6.67		0		6.67	
Medium farmers	0	1	0	0	0	0	0	0	0	0	0	0	0	0
%age	0	3.33	0		0		0		0		0		0	
Vaishali	5	21	2	1	1	0.5	1	1.5	3	0.83	0	0	3	0.83
%age	19.23	80.77	7.69		3.84		3.85		11.54		0		11.54	
Marginal Farmers	2	7	1	0.5	1	0.5	0	0	1	1	0	0	1	1
%age	7.69	26.92	3.85		3.84		0		3.85		0		3.85	
Small Farmers	2	9	1	1.5	0	0	1	1.5	1	1	0	0	1	1
%age	7.69	34.62	3.85		0		3.85		3.85		0		3.85	
Semi Medium Farmers	1	5	0	0	0	0	0	0	1	0.5	0	0	1	0.5
%age	3.85	19.23	0		0		0		3.85		0		3.85	
Medium farmers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
%age	0	0	0		0		0		0		0		0	
All	11	45	3	1	1		2		8		2		6	
%age	19.64	80.36	5.36		1.78		3.57		14.29		3.57		10.71	
Marginal Farmers	3	18	1	0.5	1	0.5	0	0	2	1.25	0		2	1.25

%age	5.36	32.14	1.79		1.78		0		3.57		0		3.57	
Small Farmers	5	18	2	1.75	0	0	2	1.75	3	1.5	2	1.75	1	1
%age	8.93	32.14	3.57		0		3.57		5.36		3.57		1.79	
Semi Medium Farmers	3	8	0	0	0	0	0	0	3	1.23	0	0	3	1.23
%age	5.36	14.29	0		0		0		5.36		0		5.36	
Medium farmers	0	1	0	0	0	0	0	0	0	0	0	0	0	0
%age	0	1.79	0		0		0		0		0		0	

Table 5.47: Distribution of Dehaat farmers by category, and crop and location and purpose of training provided by F&F

Perception of training by season and purpose> Distt and category	**Yes**	**No**	***Kharif* Crops**	***Rabi* Crops**	***Zaid* Crops**	***Kharif, Rabi and Zaid* crops**	**Location Village**	**Location Dehaat Center**	**Purpose: New Variety**	**Purpose: New cropping technique**
Muzaffarpur	8	22	5	0	1	2	3	5	6	3
%age	26.67	73.33	16.67	0.00	3.33	6.67	10.00	16.67	20.00	10.00
Marginal Farmers	3	9	3	0	0	0	0	3	3	0
%age	10.00	30.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00	0.00
Small Farmers	3	9	1	0	1	1	3	0	0	3
%age	10.00	30.00	3.33	0.00	3.33	3.33	10.00	0.00	0.00	10.00
Semi Medium Farmers	2	3	1	0	0	1	0	2	0	2
%age	6.67	10.00	3.33	0.00	0.00	3.33	0.00	6.67	0.00	6.67
Medium farmers	0	1	0	0	0	0	0	0	0	0
%age	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vaishali	13	13	6	4	3	0	2	11	9	4
%age	50.00	50.00	23.08	15.38	11.54	0.00	7.69	42.31	34.62	15.38
Marginal Farmers	2	7	1	1	0	0	0	2	1	1
%age	7.69	26.92	3.85	3.85	0.00	0.00	0.00	7.69	3.85	3.85
Small Farmers	7	4	5	1	1	0	2	5	6	1
%age	26.92	15.38	19.23	3.85	3.85	0.00	7.69	19.23	23.08	3.85

Semi Medium Farmers	4	2	0	2	2	0	0	4	2	2
%age	15.38	7.69	0.00	7.69	7.69	0.00	0.00	15.38	7.69	7.69
Medium farmers	0	0	0	0	0	0	0	0	0	0
%age	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All	21	35	11	4	4	2	5	16	15	7
%age	37.50	62.50	19.64	7.14	7.14	3.57	8.93	28.57	26.79	12.50
Marginal Farmers	5	16	4	1	0	0	0	5	4	1
%age	8.93	28.57	7.14	1.79	0.00	0.00	0.00	8.93	7.14	1.79
Small Farmers	10	13	6	1	2	1	5	5	6	4
%age	17.86	23.21	10.71	1.79	3.57	1.79	8.93	8.93	10.71	7.14
Semi Medium Farmers	6	5	1	2	2	1	0	6	2	4
%age	10.71	8.93	1.79	3.57	3.57	1.79	0.00	10.71	3.57	7.14
Medium farmers	0	1	0	0	0	0	0	0	0	0
%age	0.00	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

About one-third of the farmers attended training by F&F and it was more about Kharif crops (table 5.46). Small farmers were the largest group to get the training followed by semi-medium and marginal farmers. 26% of farmers, who attended the training, reported that it was on new crop varieties whereas the other 12% found it on new cropping techniques. The cases of getting such training were higher in Vaishali (50%) than in Muzaffarpur (27%). In Muzaffarpur, more of marginal and small holders got that training whereas in Vaishali, it was more prevalent among small and medium holders. About 42% of the farmers (table 5.47) received marketing/sales support from Dehaat with small holders being the largest group followed by marginal and semi-medium (who are equal in numbers). In both the districts, small holders formed the largest group enjoying that support, however, in Muzaffarpur, they were followed by marginal farmers and in Vaishali, by semi-medium ones.

Table 5.48: Distribution of Dehaat farmers by category for marketing support provided

Support provided> District/Category	**Yes**	**No**
Muzaffarpur	13	17
%age	43.33	56.67
Marginal Farmers	4	8
%age	13.33	26.67
Small Farmers	6	6
%age	20	20
Semi Medium Farmers	2	3
%age	6.67	10
Medium farmers	1	0
%age	3.33	0
Vaishali	11	15
%age	42.31	57.69
Marginal Farmers	2	7
%age	7.69	26.92
Small Farmers	5	6
%age	19.23	23.08
Semi Medium Farmers	4	2
%age	15.38	7.69
All	24	32
%age	42.86	57.14
Marginal Farmers	6	15
%age	10.71	26.79
Small Farmers	11	12
%age	19.64	21.43
Semi Medium Farmers	6	5
%age	10.71	8.93
Medium farmers	1	0
% age	1.79	0

Across both the district, seeds found to be the primary reason among farmers to be associated with Dehaat (table 5.48). For more than 60% of the farmers in both the districts, seeds remained the prime attraction. However, more of semi-medium farmers in Vaishali than in Muzaffarpur were attracted towards Dehaat due to seeds. Better seeds & bio inputs, and better seeds & new information were the second and third most sought for services.

Table 5.49: Distribution of Dehaat farmers by net benefit of working with Dehaat

Benefit type> District/Category	Better Seeds	New Information	Marketing support	Better Seeds & Bio inputs	Better Seeds & New Techniques	Better Seeds & New Information	Better Seeds & Marketing support
Muzaffarpur	20	1	1	3	2	1	2
%age	66.67	3.33	3.33	10	6.67	3.33	6.67
Marginal Farmers	10	1	0	0	1	0	0
%age	33.33	3.33	0	0	3.33	0	0
Small Farmers	8	0	1	1	1	0	1
%age	26.67	0	3.33	3.33	3.33	0	3.33
Semi Med Farmers	2	0	0	2	0	1	0
%age	6.67	0	0	6.67	0	3.33	0
Medium farmers	0	0	0	0	0	0	1
%age	0	0	0	0	0	0	3.33
Vaishali	16	1	0	5	0	4	0
%age	61.54	3.85	0	19.23	0	15.38	0
Marginal Farmers	5	0	0	2	0	2	0
%age	19.23	0	0	7.69	0	7.69	0
Small Farmers	6	1	0	3	0	1	0
%age	23.08	3.85	0	11.54	0	3.85	0
Semi Med Farmers	5	0	0	0	0	1	0
%age	19.23	0	0	0	0	3.85	0
All	36	2	1	8	2	5	2
%age	64.29	3.57	1.79	14.29	3.57	8.93	3.57
Marginal Farmers	15	1	0	2	1	2	0
%age	26.79	1.79	0	3.57	1.79	3.57	0
Small Farmers	14	1	1	4	1	1	1
%age	25	1.79	1.79	7.14	1.79	1.79	1.79
Semi Medium Farmers	7	0	0	2	0	2	0
%age	12.50	0	0	3.57	0	3.57	0
Medium farmers	0	0	0	0	0	0	1
%age	0	0	0	0	0	0	1.79

5.6 Summary

That agribusiness sector including farm production services is a relevant sector for franchising, that too business format franchising as it (agriculture) meets the necessary and sufficient conditions for application of franchising strategy is now beyond doubt as there have been many experiments and some with success as seen in the above discussion on many models in India and elsewhere. The necessary conditions for relevance of franchising in agribusiness include: limited growth potential of an individual franchisee due to technological limits, availability of large number of potential franchisees to choose from the more suitable ones, existence of some feasible managerial and administrative function for franchising out for economies of scale and high switching cost, possibility of decentralised decision making for leveraging its benefit compared with a vertically integrated system, credit worthiness of franchisor in the presence of lack of it among franchisees, and irrelevance of idiosyncratic investments. On the other hand, additional or sufficient conditions include: possibility of multiplying learning effects and creation of competitive advantage thru transfer of management skills and technology transfer, pre-selecting the most talented franchisees to achieve dynamic competition, access to credit markets for franchisor, and use of franchising as a countervailing power to oligopolistic market power of the downstream players which are also met in the agribusiness sector.

As against COCO model, franchising offers low investment risk for franchisee, low incentive for free riding for both, low firm specific assets investment, higher level of repeat business and for the franchisee, it offers capital for expansion, and better management by franchisee than employees. Green Agrevolution Pvt. Ltd. (GAPL) as an agribusiness start-up to facilitate farmers with better inputs and extension and markets in Bihar in India used franchising model under which it ran 11 outlets/centres called Dehaat across four districts which cater to a total of 4000 farmer members (who pay Rs. 200 annually each) with each in a 10-12 km. radius with services like soil sample analysis, crop selection, and technical support during the season and marketing of produce. All 11 Dehaat centres in 2013-14 were franchisees with GAPL. Each franchisee ran only one Dehaat or outlet. Most of the Dehaat centers were operated from the franchisee's own premises to cut the cost. A Dehaat center covered an area of 5 kms around it for its operations. Within

this radius normally, 15-20 villages were covered. A basic criterion for every Dehaat was to cover upto 500 farmers around it but the area and number of villages may vary according to the density of population. The prices were fixed by the head office for all Dehaats. Farmers demanded quality products and those were supplied accordingly though F&F also promoted better quality products proactively. Each Dehaat was visited weekly by coordinator who also participated in farmers meet and visited farmers when there was a problem. There was a product exchange and movement across Dehaats when there was shortage of some of them. The promotion was carried out by Dehaat operator and also by word of mouth by farmers who were already members of the Dehaat.

GAPL went in for franchisee model as against COCO model as after two years of operations, it found that it could not reach all farmers on its own. Even though its Dehaats were lower cost, it believed that outsiders can not do good business in rural areas. Local people trust only locals and employee mentality would not work in such situations especially if it had to manage lower cost operations and still make impact and be viable. It earned less but also had less trouble due to franchisees. Scalability was an issue but training Dehaat operators and sharing profits with them was desirable. It also bought back non-chemical produce like water lemon from farmers and sold in local market. GAPL paid a small premium for non-chemical produce which was bought without any contract with growers. It also promoted and bought a new paddy variety with buy back arrangement. It supplied grain produce to processors like Godrej for feed (maize) and to some exporters. The prices paid to farmers were *mandi* price based. Farmers wanted more of input services than output services from the agency. It sold only on cash to farmers though there was a need for financial linkage as farmers were not able to buy on cash from Dehaat. It had Nectar brand being used to sell honey and *makhan*a (fox nut).

It recognized that the variety of inputs needs to be increased for scale up and higher market share. Its focus is on service for every need of a producer and based Dehaat revenue on input sales as that was more assured market. Cattle feed was an important input as every farmer had some animals. It has been able to leverage govt. subsidy for farmer training through ATMA and has received 30% subsidy on cold chains facility,

besides crate subsidy for vegetable farmers from NHM under vegetable initiative. It is of the view that it needs to attract more corporates for better viability. Small farmers, cropping pattern and low market potential for high value crops must be reasons for corporates not being interested in this area or state.

Each Dehaat covered many villages like Vaishali caters to 93 villages though many of these were local settlements, not revenue villages. Each village had 15-25 Dehaat farmers on an average but some villages had only 5-6 farmers each. But, some villages had many dozen Dehaat farmers each. There were some minimum conditions to become a franchisee like integrity and commitment besides capability to run it. Therefore, there was age specification for a franchisee, educational qualification (10^{th} or 12^{th} pass) with five year vocational experience, non-political but good social reputation besides ability to deal with people and some experience of running an enterprise or working with a rural business company for at least one year. There should not be another Dehaat in 10 sq. km. area near the Dehaat. The agreement seeks that franchisee would provide space for setting up the Dehaat and if hired pay rent for it. The franchisee is to promote Dehaat among farmers and make them members, will reach farmer need for various services like input supply, extension and sale of produce to the company office bearers and also monitor the crops grown by farmers from time to time. He was also to organize farmers into farmer clubs or SHGs of 10-15 each and hold their meetings weekly or fortnightly and help solve their farming related problems or approach company for the same.

Most of the Dehaat franchisees were set up in 2013 or 2014 with only one being from 2011. They were fairly educated with graduate or post graduation in majority cases and all had attended one week Dehaat training to begin with. They reported working from 8 hours to as many as 14 hours for their business. All of them were landowners and operators and had tubewell owned in most cases except one. Only two had tractors. Though they grew predominantly wheat and paddy but some of them did grow new and high value crops like green gram, maize, potato and other vegetables. Depending on the location and the year of start, the turnover varied from a low of less than Rs. two lakh to as much as Rs. 30 lakh per annum and this was directly proportionate to the number of

villages and farmers catered to by the franchisees and those buying inputs. Further, all of them had purchased output and had bought 1-3 crops each either directly purchasing or under a contract farming arrangement for the franchisor who in turn sold it to the ultimate buyer. All provided advice on use of fertilizers/crop protection/agri machinery, field demo/trails of farm inputs, information about innovative/improved methods of agricultural practices, information about government schemes (subsidies), technology, information about output price and Marketing/sales support for output and only one had taken farmers for exhibition visit/agricultural fair.

The farmers in Bihar are generally smallholders by and large with 92% operating less than 2 hectares. But, Dehaat farmers in general were larger than their non-Dehaat counterparts both in owned and operated land holdings. Whereas overall owned land on an average was 3.33 acres, it was 3.71 acres for Dehaat buyers and 2.78 acres in case of non-Dehaat farmers. Further across districts, it was 3.48 acres for Dehaat versus 2.63 acres for non-Dehaat in Muzzafarpur and in Vaishali, it was 3.98 acres versus 2.96 acres respectively. Operated holdings came out to be 3.63 acres on an average but 3.89 acres and 3.27 acres for Dehaat and non-Dehaat categories respectably. Muzzafarpur had even larger departure from average of 3.62 acres with Dehaat going up to 3.91 acres and non-dehaat 3.2 acres with that in Vaishali being 3.87 acres and 3.35 acres respectively with overall average size being 3.65 acres. In general, Dehaat farmers cultivated more area under high value crops like fruits, vegetables, potato and maize than their non-Dehaat counterparts. The Dehaat farmers were generally more literate than their non-dehaat counterparts, some being graduates and postgraduates. But, this was not true across categories of farmers in terms of land holding. Dehaat farmers had lower cropping intensity than the non-Dehaat counterparts across both districts. One reason for this could be the higher area under fruit crops which were perennial or annual crops. But, across both categories, marginal and small farmers had a higher cropping intensity than that of other categories. In wheat and paddy, all farmers had bought seeds from the market in both districts and across Dehaat and non-Dehaat categories. But, in case of *zaid moong*, only about 51% had purchased seeds and it was more of the Dehaat farmers who had bought. Across districts, it was more in Vaishali and that too, more of Dehaat buyers,

almost all of whom had bought whereas only a small percentage of the non-Dehaat (22%) had done so. Chemical fertilisers were also widely used by all Dehaat farmers and all but 8% of the non-Dehaat farmers across crop seasons. A somewhat higher proportion of Dehaat farmers reported buying biofertilisers than their non-Dehaat counterparts which went upto 8% in *Rabi* season. PGPs were bought and used only by Dehaat farmers. Only 13% and 19% farmers bought bio-fertilizers for *Kharif* and *Rabi* seasons respectively. In Muzaffarpur, farmers used bio-fertilizers more for Rabi crops whereas it was equal in Vaishali. Only 6% farmers used bio-fertilizers for *zaid* crops and most of them were found in Vaishali. Landholding had an effect on purchase of bio-fertilizers in Vaishali only. A higher number of Dehaat farmers bought chemical pesticides in all seasons across both the districts except in case of *Zaid Moong* in Muzaffarpur where an equal number of Dehaat and Non-Dehaat farmers were inclined towards the use of chemical pesticides. Almost similar trends were found in case of purchase of weedicides/herbicides. Of those farmers who used fungicides, more of them were Dehaat farmers; with no non-Dehaat farmer in Vaishali purchasing any fungicide. Similarly, only 10-15% of the farmers applied bio-pesticides in both the seasons across both districts. Interestingly, all non-Dehaat farmers for all crops across both the districts did not use bio-pesticides.

About 60% of Dehaat farmers bought using both cash and credit and most of them were marginal and small farmers. Only 10% of the farmers faced shortage of agri-inputs at Dehaat and the major shortage was of seeds. However, the instances of shortage were relatively more in Vaishali than in Muzaffarpur. More than 80% of the Dehaat farmers in both the districts were aware of the company behind Dehaat. of those who knew, 46% visited the Dehaat outlets. However, this prevalence was higher among non-Dehaat farmers in Vaishali. Among those who knew about Dehaat, the most frequent were marginal farmers followed by small and medium holders in both the districts. However, of those who visited the Dehaat, small holders were more prominent than marginal and semi-medium holders across both districts and of those who visited, about one-third farmers found the Dehaat products as spurious and this observation was higher among Vaishali farmers than Muzaffarpur ones. About 10-16% farmers across both the districts,

could not find the products they visited for. About 43% of the farmers had their soil tested with the Dehaat farmers more inclined towards soil testing across both the districts. About 40% of the farmers had a membership of a Dehaat farmer group and a large proportion of that was composed of marginal and small farmers. More than three times of those in Muzaffarpur (20%). had membership in Vaishali (61%). However, in both the districts, semi-medium farmers were the least interested in Dehaat farmer group membership. More of marginal farmers in Muzaffarpur were members of this group whereas in Vaishali, small farmers had a higher membership rate.

Very few farmers (9%) reported that they could cut the cost of cultivation due to the Dehaat extension. But, 92% farmers reported an increase in yields. About one-fifth of the farmers in both the districts confirmed that Dehaat could help them in crop selection and this help worked more in case of *Kharif* crop selection. About one-third of the farmers attended training by F&F and it was more about *Kharif* crops. Small farmers were the largest group to receive the training followed by semi-medium and marginal farmers. About 42% of the Dehaat farmers received marketing/sales support from Dehaat with small holders being the largest group followed by marginal and semi-medium (in equal numbers). In both the districts, small holders formed the largest group enjoying that support. For more than 60% of the farmers in both the districts, seeds remained the prime attraction.

The above summary of findings of franchise operations and their farmer level impact shows that the franchise model is working but needs improvement for more effective farmer level impacts especially on small farmer livelihoods. The extension contribution of Dehaat is noteworthy as extension is more by default than by design in mainstream agri input marketing channels. On the other hand, in the context of abolition of APMC Act in the state, Dehaat is making an important contribution by facilitating a new and more direct market linkage for small farmers in new and high value crops which need prompt handling.

Chapter 6

Summary, Conclusions, and Policy implications

6.1 Introduction and Approach

There are many types of innovations like technological, social, or product, process, marketing and organizational and institutional innovation is one type. Institutions include both organisations and institutions and formal and informal 'rules of the game'. Institutions shape human interactions and, therefore, efficiency and productivity, and institutional innovations drive development. There could be path dependence in institutions versus innovations in institutions. Institutional innovations could be in land system, labour system, social systems and organisation of activity-production and marketing, including market and policy reforms and innovations could take place in a top down or bottom up manner. Institutional innovations entails a change of policies, standards, regulations, processes, agreements, models, ways of organizing, institutional practices, or relationships with other organizations, so as to create a more dynamic environment that encourages improvements in the performance of an institution or system to make it more interactive and competitive (IICA, 2014, p.4).

Major concerns in institutional innovations include: they generally take place outside the formal system to begin with, there is very little policy support before proven, market, social, or environmental entrepreneurship driven innovations, exclusion from and inclusion in institutional innovation which depends on type of crop, place, technology, market, and/or type and nature of organization of activity, and sustainability, and scale up of such innovations (Totin et al, 2012).

Agro inputs encompass not only crop related inputs like seed, fertiliser, and crop protection products but also seedlings, feeds, and machines which support crop and allied production. The availability, accessibility, quality and price have been major issue in this sector from the farmer perspective. There are issues of lack of availability of major consumable inputs in adequate quantity on time, reliable quality or spurious products

especially in seed and crop protection products and feed. This dimension of agribusiness hits the farm production subsector hard as poor input quality and economics compromise the entire agribusiness sector especially farmers and output users whose costs go up and benefit is reduced. But, it is important to recognise that in agribusiness sector, the agro-input sector is the most crucial even to attend to concerns of food quality, food safety, and cost competitiveness. On the other hand, ago-inputs are crucial for small farmers in terms of yield enhancement, cost cutting, and better quality production for better price realization.

In the recent past, there have been many experiments in the ago-input sector in terms of new distribution and marketing channels and some players have attempted to deliver total solutions to farmers including farm and allied inputs. These new channels range from marketers own outlets to supermarkets to franchised outlets besides traditional mainstream channel of selling through distributors and dealers/retailers. The major ones include: ITC's Choupal Sagar, Khushali Krishi Kendras of Hydric, Champion Agro, and Mana Gromor of Coromondal Group. They also operate in/across different states of India. There are also agri startups like Green Agrevolution and Zamindara Farm Solutions which also attempt same objectives for small farmers. Further, there is another parallel trend of custom rentals of farm machinery which started in Punjab in late 2000s and has spread quickly across many villages supported by the state government to cut down cost of cultivation for small farmers. Besides, there are many private initiatives in this space where it is being attempted as business model and the only way to promote cost effective mechanisation in smallholder dominated context.

But, there have been no independent studies on the rationale, organisation and performance of the new models in comparison with existing channels. The performance of these new channels especially needs to be assessed in terms of farmer relevance and benefit. Also, most of the documentation on these models is in the form of teaching cases and not research papers or documents.

In this context of changing institutional landscape of agro-input marketing and selling, the study:

1. Explores the distribution channels and business models of new (innovative) agro-input players in India
2. Examines the small holder inclusiveness of such channels and the nature and the level of effectiveness in helping the farmers access better inputs and services
3. Identifies major issues and challenges in delivery of input services across regions and types of farmers and
4. Examines the possible policy and enabling provisions to promote cost and quality effective agro-input channels.

Given that these models and initiatives are state specific in many cases, a check list of all major players in states like Punjab, UP, Bihar, and AP was prepared. For each type of player in each location, a sample survey of a few retail level functionaries like franchises in agri machinery rental in Punjab and F&F/GAPL franchises in Bihar was attempted. Further, a farmer level survey of the farmers being serviced by an outlet or retail agency in each case was undertaken to compare and contrast the services offered by traditional channel or two modern channels. In whichever state, more than one new models exist, at least two of them were covered. A set of at least a dozen farmers (covering different sizes) in case of each outlet/local player was covered to assess the impact on the farmers and problems encountered. Thus, we interviewed 84 farmers reaching in Punjab across PACS and ZFS franchisees, 112 in UP and 95 in Bihar which included both modern channel linked as well as non-modern channel linked farmers to compare and contrast the difference in order to see the impact of new channels especially on small farmers and these sub-samples were comprised of various categories of farmers keeping in mind the local farmer population profiles. Thus, across models, states and farmer categories, 6 PACS, 11 franchisees and 291 farmers were interviewed. Further, the business and operational aspects of the new channels were understood from interviews with key functionaries for a few hours each besides visits to the outlets and field operations and collection of data from each one of them.

6.2 Major findings

6.21 Agri machinery rental services in Punjab

The ZFS franchises were into custom rentals since average of three years varying from 1-5 years and two of them were landless while others had medium land holdings with one of them leasing land as well, operating an average of 11 acres most of it owned in most cases. By occupation, they were drivers, or farmers or mechanics. They catered to farmers across as many as 5 villages on an average ranging from 3-8 villages with average farmers served being 56 per year ranging from 10-200. Mostly, booking was done by farmers on phone or by personal visit to the franchisee service provider and mode of payment was cash only which was either paid at the time of booking, or after service delivery or part advance and part after service and only one service provider reporting part credit provision. Maintenance was not a big issue as it was partly taken care of by franchisor (ZFS) and only partly met by service provider. Two of the five franchisees reported achieving viability while others still have to achieve it. It took 2 and 4 years each to reach viable operations and the other three were either into loss making or just break-even stage. The main reason was that they were either new businesses or had bought some costly machines.

Of the 6 PACS studied, all were on an average working in this activity for 5 years ranging from 4-7 years and mostly started this business during 2007-2010 with majority in the last two years (2009 and 2010) and all have staff which was fulltime which average 2 varying from 1-3. Each one had at least one driver for running the service. The membership of PACS ranged from 477 to 1146 with average of 750 farmer members with only one having less than 400 members. But, only 68% members were active on an average. Of all members, only 10% were making use of rental services ranging from 45-150 members across PACS. Three PACS (50%) had 50-100 members each using the services. Each PACS had one or two tractors with majority having only one on average. A tractor worked for 553 hours on an average ranging from just 40 hours in one case to as many as 1000 hours in another case. Only one PACS had a trailer.

Seed drill was most commonly owned by PACS with some having as many as 4 and on average 2.5 each but it was used for 95 hours per year on an average ranging from 10-240 hours. Since potato was not widely grown the area, potato planter was available with only one PACS and was used for only 60 hours. All these PACS had availed of subsidy from PSFC of the order of 33% on major machines like tractor and equipment like rotavator and laser leveller. Further, some PACS (2) had availed of bank loan to add to their portfolio or buy machines and equipment besides subsidy while others had put their own money into these assets. One of the two had already repaid the bank loan while the other was yet to do so.

Rotavator, laser land leveller and disc harrow emerged as the most hired equipment across all the PACS with two each reporting in each category. The farmers avail of these and other equipments by mostly visiting the PACS centre (reported by 50% PACS) and also by telephone booking or advance payment booking on first come first serve basis. Payment for the service is generally some advance and some after delivery of service (67% PACS reporting that) followed by only after delivery of service and advance plus part payment after service and part credit.

But, none of the PACS tried borrowing or exchanging machines or equipment across neighbouring PACS. They were also not promoting their services specifically. While four had achieved viability, the two were still to do so. The viability was achieved over 5 years by two of them and over six by another and in just 4 years by one of them. Only two of them faced competition from other players in this service business. The major problems reported in achieving viability in two PACS was delayed payment from farmers and lack of staff to provide the service.

All of them reported serving small farmers with one claiming 100% if its members being small and others 25-99% farmers being small with just one admitting that only less than 25% were small farmers. The surveyed user farmer profile showed that these claims are far from reality in most cases as operated holding are very large on an average. Also, since most hired equipment is laser leveller, rotavator and the like, and general tractor

ownership is on average one, and the tractor is not used that much which should be cause for concern as that is the costliest machine for a farmer.

ZFS franchisee served farmer operated holdings were mostly large and medium accounting for 78% of all farmers. Further, farmers had this land at multiple places with average plots being 2.4 ranging from 1-4. Further, 2/3 of them owned tractors and some had more than one each with some owning cultivator (50%) seed drill, planker and disc harrow (28% each) and two owning combine harvesters (14%). This shows that ZFS caters to both large and small farmers depending on the local area and the franchisee operations. They hired multiple machines ranging from 2-10 with most frequent number being 2 and 5 and average being about 5 machines. Combine was used by all of them and tractor by 50% of them for 20-40 hours unlike their ZFS exclusive ones who used it only for less than 20 hours each.

Most of the ZFS franchisee serviced farmers (70%) had semi-medium, medium and large land holding under paddy with only 21% not growing it at all. On the other hand, cotton was grown on much smaller area (semi-medium size) or not grown by a majority of the farmers at all (57%). Wheat was grown by all farmers as it did not compete with other crops in season unlike paddy and cotton competing with each other in the same season. Only three PACS farmers grew potato on a small area of their land ranging from less than 5 acres to 10 acres. Other crops were grown only in less than 5 acres in all categories except in case of one farmer in ZFS plus local service takers and two each in case of PACS and local and only local sources.

ZFS franchisee serviced farmers generally hired one or two machines (64% and 21% each) with a few renting in three machines each. Tractor was the most common hired machine (by 50%) followed by rotavator alone or with tractor i.e. 35% and 28% each respectively. Tractor was hired for less than 20 hours in majority cases.

The ZFS and local custom rental service user farmers were generally smaller than their ZFS counterparts both in owned and operated land on an average which ranged from 2-30 acres and 2-52 acres respectively. They were younger in age, had smaller number of plots

of land and lesser ownership of tractors. Though they had smaller cropped area of wheat, paddy and cotton as they had lower operated holdings, they hired in many more machines and equipment than their ZFS exclusive counter parts.

In general, the PACS service using farmers were medium or large operators with average owned holding of the order of 12 acres and operated size of 19 acres ranging from complete landless and operating just four acres of leased land to as much as 43 acres of owned and 45 acres of operated land. Except one, no one had any other occupation. 41% did not lease in any land and 89% did not lease out any. Only three PACS farmers leased out some land ranging from less than five acres to as much as more than 25 acres. Finally, in terms of operational land categories, only 2 were small and two medium with the rest 85% either medium or large category land operators with as many as up to 5 plots with average being 2.4. The average number of tractors was 1.22 with four farmers not having tractors at all (15% of total). Some of them did not grow paddy and cotton at all and others average of 13 and 4 acres respectively. Every farmer grew wheat and average of 17 acres. Interestingly, on average they hired 3.6 machines from PACS centres and they mostly used non-tractor equipment or tractor with equipment if they did not have tractor followed by laser leveller. Rotavator was the most used equipment and the costliest per hour followed by combine harvester.

96% of the PACS farmers were satisfied with the service with 11% rating it very good and other as good and only one farmer rating it poor. The reason for satisfaction was good availability of service in 93% cases. Earlier , most of them used only local sources and few reporting other means like relatives and other sources with only one reporting PACS as the earlier source as well. Lower cost was a major benefit of the PACS service as it was for local source. Also, availability for infrequent use was a good reason as it would be difficult to buy a machine for infrequent use. Availability and proximity were the major reasons for use of service from PACS and local sources.

As against new service providers, in case of local sources, farmers were also generally smaller land holders or operators than their ZFS counterparts and had this land in just two places on an average. Only two farmers had leased out land and that was in the range of

10-25 acres each. Interestingly, 30% of them did not grow paddy and 50% did not grow cotton while all were growing wheat. They had one tractor with them on an average and hired only two machines each ranging from 2-7 payment was made on delivery of service in majority cases (72%) and on part advance and part on delivery in 21% cases and only one farmer reporting advance and some day's credit. All of the farmers were satisfied with rental services rating it as good (71%) or very good (29%) and it was mainly on availability (79%) as satisfactory or the quality of service (15%) they had rated these service providers. Earlier, these farmers either did not use rental machinery (50%) or used local sources (30%) only or managed through other means (20%).

An examination of the business models of the two custom rentals models of machinery and equipment in Punjab shows that there is plenty of demand for such services from small farmers in general and from other categories of farmers also for some costly machines that cannot be owned at the individual farmer level. The use of PACS has been an innovative move on the part of the PSFC as it is a local level member based agency which is known for its farmer linkage as it also supplies fertilisers and working capital loans to member farmers. The farmer level analysis of their services across types of farmers – both ZFS, local individual sources, PACS and other combinations shows that across all cases, farmers are generally happy using services though in some cases there are issue of price of service or timely availability as the sowing or harvesting windows are short.

Further, it is found that private custom rental service was more focused on larger land operators compared with PACS serviced or local service provider served farmers. Partly, this could be due to the general profile of the operational area of the private player and partly due to its focus on modern and larger machines compared with PACS portfolio. But, it is important that both these players proactively reach and serve smallholders as it is for them or in their name that public subsidy is being extended to these players for this service. It is also likely that small holders would be more durable users of their services as they might not acquire such machines on their own any time sooner than larger farmers.

6.22 Agri input supermarket in Uttar Pradesh

An analysis of the supermarket (K3) and non-supermarket buying farmers showed that K3 buyers were smaller farmers in general than their non-buying counterparts especially those who exclusively bought from K3. But, on an average, K3 buyers (exclusive) leased in much higher land on an average both in Lakhimpur and Barabanki than their non-K3 counterparts. The average operated land size of K3 non-exclusive buyers in Lakhimpur was as high as 11 acres while of those who bought exclusively, it was only 6 acres.

In general, K3 exclusive buyers were less likely to own tractors compared with their K3 buyer counterparts and non-K3 buyers in both the districts but Barabanki, in general, had lower ownership of tractors across all categories compared with those in Lakhimpur. This was also due the fact that land holdings in Barabanki were much smaller than those in Lakhimpur. Of all, only 50% of farmers owned a tractor. Further, more of small and marginal farmers had tractors in Barabanki than in Lakhimpur.

In general, it was medium category farmers who were aged with average age being 51 years. On the other hand, among non- K3 buyers, it was marginal and small farmers who were older in age on average, especially those in Barabanki than their other counterparts. The Barabanki farmers had higher levels of literacy including in K3 exclusive category and in general there were relatively few graduate and post-graduate farmers and they (graduates and PGs) were mostly in non-buyer or non-exclusive buyer category so far as K3 was concerned. Interestingly, a large proportion of farmers reported being members of farmer collectives like PACS or sugarcane societies i.e. 45% of all and it was more the case in Lakhimpur where sugarcane samitis are common whereas in Barabanki, it was only PACS which were used by some farmers (10%). Infact, a good proportion of farmers in Lakhimpur were members of both sugarcane samitis and PACS.

In cropping pattern, there were clear differences across districts and sets of farmers. Sugarcane was mainly found to be grown in Lakhimpur and accounted for 23% of GCA with K3 exclusive byers putting as much as 50% area under it and other K3 farmers only

19%, thus altogether 25% of K3 buyer farmer area being under sugarcane. Compared with this, non-k3 buyers had only 20% area under the crop. Further, in Barabanki, it was a small time crop with only 1% area under it and that too mainly in case of non-K3 buyers who had 4% area under it. The K3 categories did not go for it at all. Overall, 15% of all surveyed farmer GCA was under sugarcane and average was 3.84 acres with those in Lakhimpur having 3.96 acres on an average. In *Kharif*, major crop was paddy across both districts with share of 33% and 36% of GCA in Lakhimpur and Barabanki and 34% of area across districts followed by wheat in *Rab*i which was equally important with 33% and 24% of GCA in Lakhimpur and Barabanki, the overall share of wheat in GCA being 30%. Further, it was exclusive buyers of K3 who grew relatively less paddy, maize and wheat and more of pulses, mustard, menthe, potato and vegetables across both the districts as %age of GCA, which are all high value crops. They were also more into sugarcane compared with their other counterparts in Lakhimpur.

In general, Barabanki had higher cropping intensity than Lakhimpur and further marginal farmers in Lakhimpur had higher cropping intensity than other categories except large ones and in Barabanki it was not very different across categories. K3 exclusive buyers were less intensive than others and in Barabanki they were the most intensive cultivators of their land.

It was mostly paddy seed and wheat seed which were bought from the market by all types of farmers and there were no differences across categories or districts. Similarly, all farmers used chemical fertilisers except one in Barabanki. Micro nutrient use was higher among K3 buyers than among non-buyers and lower for *Zaid* crops in Barabanki. PGPs were mostly used in *Rabi* and *Zaid* crops and not much in sugarcane or *Kharif* paddy across categories and districts. Very few farmers bought sugarcane seed while every farmer bought wheat and paddy seed irrespective of farm size category. Chemical pesticides were widely used across crops and seasons and farmer categories except in *Rab*i where one-third farmers did not use them. Non-K3 buyers especially in Barabanki used much less pesticides. Weedicides were more commonly used in *Kharif* paddy and *Zaid* paddy. Fungicides were more common among K3 farmers than among non-K3

farmers but only 1/3 to 50% of farmers across crops and categories used it. It was much less used in sugarcane and wheat. Micronutrients were used more by large and medium farmers in Lakhimpur as well as in Barabanki in wheat and paddy but in sugarcane in Lakhimpur, it was smaller farmers who bought less of micronutrients. PGPs were used more in *Rabi* (wheat) and *zaid* crops and very few farmers used it in sugarcane and paddy. Only two farmers bought biofertilisers and in Barabanki, none bought biopesticides and even in Lakhimpur, it was 5% farmers who bought it and all of them were K3 buyers wholly or partly. No non-K3 buyer bought any bio-pesticides.

In general, more of non-K3 farmers bought inputs on cash and more of Barabanki farmers bought them on cash and within the district, it was smaller holders who paid in cash more often. On the other hand, K3 farmers in both districts largely bought it on cash. Most of the K3 farmers bought inputs on cash (83%) across categories and districts. In terms of quality and effectiveness of service by K3 outlets, the shortage of inputs was reported mainly by small, marginal and semi-medium farmers in both districts with 87% farmers reporting it and mainly in chemical fertilisers and to some extent in seed. The major dimension reported was shortage in season. Even in each district, the picture was similar though farmers also reported a combination of inputs for shortage and multiple dimensions for shortage. Further, a higher proportion of non-exclusive buyers reported shortage at K3 outlets though it was mainly seasonal shortage and mainly of fertilisers and seeds to some extent.

There was no interlocking of markets in case of K3 as it was not into output buying or credit sales. Even non-K3 buyers did not report any compulsion to sell produce to the input/credit provider. All respondents were satisfied with the qualification of K3 staff required to provide agricultural advice. All of them also were given receipt for their purchase from K3. But, 85% of the farmers did not know the company behind the K3 brand of stores. More of the non-exclusive buyers were not aware of the company behind K3 outlets.

Only 17% of the K3 farmers reported some decline in cost of production due to extension provided by K3 staff but it was not specific to those who bought exclusively from K3 stores. Further, in majority cases, the cost reduction was only upto 15% compared with earlier costs. Further, it was small and medium farmers who found this reduction in their costs of production and not large or marginal farmers. Of the total sample, only 10% reported the cost of production decline lower than 15% with 5% reporting it to be 15-30% cost reduction. Major reason for this cost reduction was proper utilisation of various resources especially in case of small farmers in Barabanki. Further, the cost reduction due to better utilisation of resources was more appreciated by non-exclusive farmers. 1/3 of the farmers also reported receiving help from K3 staff on selection of crops with small and marginal in Lakhimpur and medium and semi-medium in Barabanki even going upto 40-60% of the total in their category. More of non-exclusive buyers appreciated this help in crop selection than the exclusive buyers. More interesting was the farmer response on increase in yield due to K3 help which was recognised by 91% of farmers going up to 95% in Lakhimpur and more so in case of small, semi-medium and medium categories farmers across the two districts. 40% farmers each reported yield increase of upto 15% and 15-30% each and 10% even as much as more than 45% increase in their crop yields. Further, it was non-exclusive farmers who reported these yield increases in large proportions. The yield increase was attributed to better seeds, better chemicals and better fertilisers and a combination of these factors in most cases. Here again, non-exclusive buyers reported these factors much more perhaps due to the fact that they were able to compare K3 inputs with other source inputs as they were using both.

Thus, the K3 outlets were inclusive of small farmers and were more inclusive than traditional channels and helped farmers achieve higher yield, lower costs of production and better resource management though they were still plagued by shortage of fertilisers as there is government allocation of fertilisers every season. But, still the K3 stores need to do better to get more loyalty which was limited only to a small percentage of buyers right now. This could be partly due to implicit interlinking of credit and input markets and partly due to lack of output linkage with farmers which takes them to other channels.

6.23 Franchising in Bihar

Green Agrevolution Private Limited (GAPL) as an agribusiness start up to facilitate farmers with better inputs and extension and markets in Bihar used franchising model under which it ran 11 outlets/centres called Dehaat across four districts which catered to a total of 4000 farmer members (who paid Rs. 200 annually each) with each in a 10-12 km. radius covering 15-20 villages each with services like soil sample analysis, crop selection, and technical support during the season and marketing of produce. All 11 Dehaat centres in 2013-14 were franchises with GAPL. Each franchisee ran only one Dehaat or outlet. Most of the Dehaat centers were operated from the franchisee's own premises to cut the cost. A basic criterion for every Dehaat was to cover upto 500 farmers around it but the area and number of villages varied according to the density of population. The prices for all Dehaats were fixed by the GAPL head office. Farmers demanded quality products and those were supplied accordingly though F&F also promoted better quality products proactively. Each Dehaat was visited weekly by a coordinator who also participated in farmers meets and visited farmers, when there was a problem. There was a product exchange and movement across Dehaats when there was shortage in some of them. The promotion was carried out by the Dehaat operator and also by word of mouth by farmer members of the Dehaat.

GAPL went in for franchisee model as against COCO model as after two years of operations, it found that it could not reach all farmers on its own. Even though its Dehaats were lower cost, it believed that outsiders cannot do good business in rural areas. Local people trust only locals and employee mentality would not work in such situations especially if it has to manage lower cost operations and still make impact and be viable. It earns less but also has less trouble due to franchisees. Scalability was an issue but training Dehaat operators and sharing profits with them was desirable. It also bought back non-chemical produce like water lemon from farmers and sold in local market F&F paid a small premium for non-chemical produce which was bought without any contract with growers. It also promoted and bought a new paddy variety with buy back arrangement. It supplied grain produce to processors like Godrej for feed (maize) and to some exporters. The prices paid to farmers were *mandi* price based. Farmers wanted more of input

services than output services from the agency. It sold only on cash to farmers though there was a need for financial linkage as farmers were not able to buy on cash from Dehaat. It had Nectar brand being used to sell honey and *makhan*a (fox nut).

It recognized that variety of inputs needs to be increased for scale up and higher market share. It is of the view that it needs to attract more corporates for better viability. Small farmers, cropping pattern and low market potential for high value crops must be reasons for corporates not being interested in this area or state.

Each Dehaat covered many villages like Vaishali caters to 93 villages though many of these were local settlements, not revenue villages. Each village had 15-25 Dehaat farmers on an average but some villages had only 5-6 farmers each. But, some villages had many dozen Dehaat farmers each. There were some minimum conditions to become a franchisee like integrity and commitment besides capability to run it.

Most of the Dehaat franchises were set up in 2013 or 2014 with only one being from 2011. The franchisees were fairly educated with graduate or post-graduation in majority cases and all had attended one week Dehaat training to begin with. All of them were land owners and operators and had tubewell owned in most cases except one. Only two had tractors. Though they grew predominantly wheat and paddy but some of them did grow new and high value crops like green gram, maize, potato and other vegetables. Depending on the location and the year of start, the turnover varied from a low of less than Rs. two lakh to as much as Rs. 30 lakh per annum and this was directly proportionate to the number of villages and farmers catered to by the franchisees and those buying inputs. Further, all of them had purchased output and had bought 1-3 crops each either directly purchasing or under a contract farming arrangement for the franchisor who in turn sold it to the ultimate buyer. All provided advice on use of fertilizers/crop protection/agri machinery, field demo/trails of farm inputs, information about innovative/improved methods of agricultural practices, information about government schemes (subsidies), technology, information about output price and Marketing/sales support for output and only one had taken farmers for exhibition visit/agricultural fair.

The farmers in Bihar are generally smallholders by and large with 92% operating less than two hectares each. But, the Dehaat farmers in general were larger than their non-Dehaat counterparts both in owned and operated land holdings. Whereas overall owned land, on an average was 3.33 acres, it was 3.71 acres for Dehaat buyers and 2.78 acres in case of non-Dehaat farmers. Further across districts, it was 3.48 acres for Dehaat versus 2.63 acres for non-Dehaat in Muzafarpur and in Vaishali, it was 3.98 acres versus 2.96 acres respectively. Operated holdings came out to be 3.63 acres on an average but 3.89 acres and 3.27 acres for Dehaat and non-Dehaat categories respectably. In general, Dehaat farmers cultivated more area under high value crops like fruits, vegetables, potato and maize than their non-Dehaat counterparts. The Dehaat farmers were generally more literate than their non-Dehaat counterparts, some being graduates and postgraduates. But, this was not true across categories of farmers in terms of land holding. Dehaat farmers had lower cropping intensity than the non-Dehaat counterparts across both districts. One reason for this could be the higher area under fruit crops which were perennial or annual crops. But, across both categories, marginal and small farmers had a higher cropping intensity than that of other categories. In wheat and paddy, all farmers had bought seeds from the market in both districts and across Dehaat and non-Dehaat categories. Across districts, it was more in Vaishali and that too, more of Dehaat buyers, almost all of whom had bought whereas only a small percentage of the non-Dehaat (22%) had done so. Chemical fertilisers were also widely used by all Dehaat farmers and all but 8% of the non-Dehaat farmers across crop seasons.

A somewhat higher proportion of Dehaat farmers reported buying biofertilisers than their non-Dehaat counterparts which went upto 8% in Rabi season. PGPs were bought and used only by Dehaat farmers. Only 13% and 19% farmers bought bio-fertilizers for Kharif and Rabi seasons respectively. In Muzaffarpur, farmers used bio-fertilizers more for Rabi crops whereas it was equal in Vaishali. Only 6% farmers used bio-fertilizers for *zaid* crops and most of them were found in Vaishali. Landholding had an effect on purchase of bio-fertilizers in Vaishali only. A higher number of Dehaat farmers bought chemical pesticides in all seasons across both the districts except in case of *Zaid Moong*

in Muzaffarpur where an equal number of Dehaat and Non-Dehaat farmers were inclined towards the use of chemical pesticides. Almost similar trends were found in case of purchase of weedicides/herbicides. Of those farmers who used fungicides, most of them were Dehaat farmers. Similarly, only 10-15% of the farmers applied bio-pesticides in both the seasons across both districts. Interestingly, all non-Dehaat farmers for all crops across both the districts did not use bio-pesticides.

About 60% of Dehaat farmers bought using both cash and credit and most of them were marginal and small farmers. Only 10% of the farmers faced shortage of agri-inputs at Dehaat and the major shortage was of seeds. However, the instances of shortage were relatively more in Vaishali than in Muzaffarpur. More than 80% of the Dehaat farmers in both the districts were aware of the company behind Dehaat. Of those who knew, 46% visited the Dehaat outlets. However, this prevalence was higher among non-Dehaat farmers in Vaishali. Among those who knew about Dehaat, the most frequent were marginal farmers followed by small and medium holders in both the districts. However, of those who visited the Dehaat, small holders were more prominent than marginal and semi-medium holders across both districts and of those who visited, about one-third farmers found the Dehaat products as spurious and this observation was higher among Vaishali farmers than Muzaffarpur ones. About 10-16% farmers across both the districts, could not find the products they visited for. About 43% of the farmers had their soil tested with the Dehaat farmers more inclined towards soil testing across both the districts.

About 40% of the farmers had a membership of a Dehaat farmer group and a large proportion of that was composed of marginal and small farmers. More than three times of those in Muzaffarpur (20%). had membership in Vaishali (61%). However, in both the districts, semi-medium farmers were the least interested in Dehaat farmer group membership. More of marginal farmers in Muzaffarpur were members of this group whereas in Vaishali, small farmers had a higher membership rate.

Very few farmers (9%) reported decline in the cost of cultivation due to the Dehaat extension. But, more than 92% farmers reported an increase in yield. About one-fifth of

the farmers in both the districts confirmed that Dehaat could help them in crop selection and this help worked more in case of Kharif crop selection. About one-third of the farmers attended training by F&F and it was more about Kharif crops. Small farmers were the largest group to receive the training followed by semi-medium and marginal farmers. About 42% of the Dehaat farmers received marketing/sales support from Dehaat with small holders being the largest group followed by marginal and semi-medium (in equal numbers). In both the districts, small holders formed the largest group enjoying that support. For more than 60% of the farmers in both the districts, seeds remained the prime attraction.

The above summary of findings of franchise operations and their farmer level impact shows that the franchise model is working but needs improvement for more effective farmer level impacts especially on small farmer livelihoods. The extension contribution of Dehaat is noteworthy as extension is more by default than by design in mainstream agri input marketing channels. On the other hand, in the context of abolition of APMC Act in the state, Dehaat is making an important contribution by facilitating a new and more direct market linkage for small farmers in new and high value crops which need prompt handling. But, Dehaat farmers were found to be somewhat larger than their non-Dehaat counterparts in owned and operated area and also other resources. This requires that the GAPL and F&F need to rope in more of small holders to make a tangible difference to farming situations especially in a context where small farmers predominate the sector.

6.3 Policy implications

It is interesting to note that agri machinery rental services are already attracting attention of policy makers given their relevance in smallholder farming context. But, in custom hiring, there is a need to encourage this practice across all states and regions with proper incentivisation of service for providers as it is the most effective way of cutting down cost of farm production and making operations more efficient and, therefore, increase yields as well. There should also be rationalisation of equipment keeping in mind the

local needs of small farmers. Further, more services could be added or local machine owners could be encouraged to deposit their machines to such centers for their use when idle to cope up with the shortage of certain machines in peak demand season. The state support for co-operatives as has happened in Punjab needs to be replicated elsewhere and private agri starts ups in this space needs to be encouraged with softer loans by bringing them under priority sector lending for longer term loans. The use of franchising is an ideal way for agri startups and others to scale up this model as this cannot be delivered from a centralised place beyond a scale. Innovations attempting more relevant machines and equipments for such purposes need to be encouraged. Infact, schemes to promote mechanisation in farm sector for new crops like cotton and sugarcane need to keep this model in view as those machines are very costly for individual farmers to own, and make it more inclusive by involving local youth and landless or marginal farmers and professionals. The example of professional custom hiring combine operators in Maharashtra and Gujarat need to be followed. Further, franchising and micro franchising should be seen as an integral part of value chain development and promotion in small holder contexts as it can help lower costs of delivery of various services and attend to the problem of last mile delivery of basic farm and allied services.

So far as role of modern supermarket chain stores for farm input and service retailing is concerned, the K3 case study shows that it is possible to provide supermarket type provision of farm retail by managing to keep fixed costs low and yet reach small farmers effectively if the players are innovative enough. The case of public private partnership achieved by Hydric shows that it is possible to mobilise infrastructure to deliver farm services at the local level and yet be inclusive if there is cost control in fixed and operational terms. The leasing in of facilities by the company made a huge difference to the cost of operations and yet brought it close to farmers as there was focus on delivery and extension and not on creating a high end store or facility unlike the previous players who failed.

The operations across the UP state which has still not carried out any agri market reforms shows that focus on farm input supply itself can be quite significant for farmers in improving their livelihoods as it can cut down the cost and improve yields.

The sustained presence of the K3 chain of stores over the last decade shows that it is important to stick on to make inroads for farm service delivery as there are issues of interlocked markets and such other structural barriers. There is a need to encourage such supermarket initiatives if they can promise to proactively target and reach small and marginal farmers. The improved access to institutional finance for small farmers can give a further flip to the modern supermarket based farm service and input retail in India.

The functioning of the Dehaat centres and the farmer uptake of it shows that new channels can lead to more informed farmer level input use and realization of higher prices in small holder context. But, as revealed by GAPL case study, the shortage of capital to scale up such innovative initiatives remains an issue. It is here that the role of investment support for agri startups is needed and the startup fund can be channelized to such innovative agencies. Further, as has been done by the MoA recently where it is made mandatory to have a degree in agricultural sciences to obtain a farm input distribution license, such agencies can fill the space and step in larger numbers to provide more effective and timely extension backed by farm input supply and output handling services.

Further, large agri input agencies can be encouraged to work with such small scale yet promising players to give them support in distribution and new product handling as they have more qualified staff and can educate farmers about new products adequately. Further, input subsidy should be delinked from input sale and rather be given for creation of market for more sustainable farm input products so that marketing and selling pressures do not come in the way of creation of markets for new products for sustainability.

Another inference from the Bihar case study is that despite all the failures of many large scale agencies in delivering total solutions to farmers, the objective remains important

and it is crucial to find new ways of meeting this need as it is only through market oriented farm production and its handling that small holders can stay put in and earn a decent livelihood from farming. On the other hand, producers' agencies are important to work with such initiatives to lower cost of operations and get a win win situation for all involved, especially in arrangements like franchising. Such players can leverage the government schemes for such producer collectivization and handholding for some time and building local platforms for better market interface so far as timely, quality and cost effective agro input delivery is concerned.

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Annexure 1: Reviewer comments on the study

- The report is an attempt to look at four agricultural inputs marketing innovations in three different states along the parameters of inclusiveness and effectiveness in providing access to better inputs. By doing so, this report attempts to lay out the major challenges in delivery of input services across regions and by types of farmers. The report then intends to provide policy inputs in these regard.

- The rationale for selection of the particular states and the particular innovative models has not been adequately explained. This needs to be explained on what basis these models in the states were selected.

- There is also less clarity on selection of sample of farmers for primary survey. In some case studies, control farmers were selected while in some it has not been. The reasons for doing so have not been mentioned. It could be logistical or based on some sampling criteria. The study does not mention these reasons and some of the inferences have to be based on these sampling criteria.

- Some of the findings from review in chapter 2 could be tabulated as reading the current version is cumbersome and there is no clarity on what the summary of findings are.

- Some of the tables in chapter 3 are redundant and do not convey any information. For example table 3.3 and table 3.4 convey the same information and there is no need for two tables. Even one table is not needed for providing such information. If a single line saying there were 5 ZFS franchisees operating 1, 2, 3, 4 and 5 years, that should have been enough. Table 3.5 and 3.6 is about classification of franchisee owners and not franchisees as mentioned in the tables. There are lots of other redundant and is informed tables in various chapters which need to be remade to make the report clear.

- Page 60 refers to farmers saying satisfied with rental services, but these findings have not been tabulated. There is also a reference to quality of service which not present in the tabulated results.

- Page 78 again refers to 96% of the PACS farmers being satisfied with the

service of custom rental. There is no tabulation of farmers' assessment. Similar things apply to other rental services referred.

- Chapter 4 also has cumbersome number of tables which could have been detailed in much lesser tables and much more clearly. They are better redone and information provide currently. Summary statistics of farmers (age, caste, district, religion, education etc.,) could be just put in one or two tables more clearly than about the first 16 tables created in the chapter. At least some of the tables could be put in appendix as the information currently conveyed is highly confusing.

- The sample size in some cases is so small for making general statements related to inclusiveness. This has to be mentioned in the report. For example, in chapter 4, the author says more small and marginal farmers bought from HKB than traditional sources and it was reverse for larger farmers. This statement cannot be tested for statistical significance given the small sample size and this needs to be mentioned either there or once in the report's summary. This caveat will help in preventing making wrong inferences/policies based on the study.

- The author should also mention the terms of credit repayment in each of these models. There is no mention of that and a comparison is made between cash and credit mode of payment by farmers in different purchases. If there are no formal terms that exist, at least an informal procedure followed by the franchisees/outlets of different models needs a mention in the report.

- In page 129, the author mentions that pesticide was the most thing related to which extension was required. Is this finding based on this study? If so, what are the other things in which farmers needed extension? There is no table with this information.

- Page 160: Here again table 5.4 refers to franchisee when it is actually about franchisee owners/operators. Such corrections need to be made in all the different tables in the report. In chapter 5, the levels of cost reduction used (<15% and 15-30%) is different from varying levels used in chapter 4. Similarly, the reason for cost reduction used is only 2 compared to more than 4 in chapter 4. Is there any reason for having this discrepancy?

- The conclusions/policy suggestions could be more specific. Which of the competing models is better in terms of inclusiveness and which is the one in terms of efficiency of delivery and which of them is better if both have to be considered in tandem? This kind of thing needs to be mentioned more specifically in line with objectives of the study.

- Finally, the report needs proper proof reading and English editing as it suffers from spelling and grammatical mistakes. This makes comprehending the contents difficult at stages.

Annexure 2: Author's response to the reviewer comments

Reviewer comments	Author's response
1. The report is an attempt to look at four agricultural inputs marketing innovations in three different states along the parameters of inclusiveness and effectiveness in providing access to better inputs. By doing so, this report attempts to lay out the major challenges in delivery of input services across regions and by types of farmers. The report then intends to provide policy inputs in these regard.	Response not required.
2. The rationale for selection of the particular states and the particular innovative models has not been adequately explained. This needs to be explained on what basis these models in the states were selected.	Explanation added to the introductory chapter in methodology section
3. There is also less clarity on selection of sample of farmers for primary survey. In some case studies, control farmers were selected while in some it has not been. The reasons for doing so have not been mentioned. It could be logistical or based on some sampling criteria. The study does not mention these reasons and some of the inferences have to be based on these sampling criteria.	In all cases, control farmers are there. In case of UP and Bihar, they are called non-K3 and Non-Dehaat respectively while in case of Punjab, the control farmers are those who use local sources as against that of both PACS and ZFS.
4. Some of the findings from review in chapter 2 could be tabulated as reading the current version is cumbersome and there is no clarity on what the summary of findings are.	Generally, review of literature does not have tables and therefore, tables are not provided, but review has been rewritten to make it less cumbersome where needed.
5. Some of the tables in chapter 3 are redundant and do not convey any information. For example table 3.3 and table 3.4 convey the same information and there is no need for two tables. Even one table is not needed for providing such information. If a single line saying there were 5	Table 3.3 and 3.4 have been replaced with text. The nomenclature of franchisees has been changed to franchise owners in relevant tables.

ZFS franchisees operating 1, 2, 3, 4 and 5 years, that should have been enough. Table 3.5 and 3.6 is about classification of franchisee owners and not franchisees as mentioned in the tables. There are lots of other redundant and is informed tables in various chapters which need to be remade to make the report clear.	
6. Page 60 refers to farmers saying satisfied with rental services, but these findings have not been tabulated. There is also a reference to quality of service which not present in the tabulated results.	Since most of the farmers are satisfied, there was no need to have table representing that.
7. Page 78 again refers to 96% of the PACS farmers being satisfied with the service of custom rental. There is no tabulation of farmers' assessment. Similar things apply to other rental services referred.	Same as above
8. Chapter 4 also has cumbersome number of tables which could have been detailed in much lesser tables and much more clearly. They are better redone and information provide currently. Summary statistics of farmers (age, caste, district, religion, education etc.,) could be just put in one or two tables more clearly than about the first 16 tables created in the chapter. At least some of the tables could be put in appendix as the information currently conveyed is highly confusing.	Summary statistics table is added and some tables have been taken to the Appendix.
9. The sample size in some cases is so small for making general statements related to inclusiveness. This has to be mentioned in the report. For example, in chapter 4, the author says more small and marginal farmers bought from HKB than traditional sources and it was reverse for larger farmers. This statement cannot be tested for statistical significance given the small sample size and this needs to be mentioned either there or once in the report's summary. This caveat will help in preventing making wrong inferences/policies based on the study.	The limitation of small sample size has been mentioned in methodology section in chapter1 but it is important to note that the approach used in this study is case studies which is more about how and why issues and also understanding the functioning of the model, not necessarily about

	representativeness.
10. The author should also mention the terms of credit repayment in each of these models. There is no mention of that and a comparison is made between cash and credit mode of payment by farmers in different purchases. If there are no formal terms that exist, at least an informal procedure followed by the franchisees/outlets of different models needs a mention in the report.	In UP and Bihar, innovative models do not extend credit to farmers by and large, and the credit issue was mainly important for control farmers and rental services in the case of Punjab.
11. In page 129, the author mentions that pesticide was the most thing related to which extension was required. Is this finding based on this study? If so, what are the other things in which farmers needed extension? There is no table with this information.	The information was not worth tabulating.
12. Page 160: Here again table 5.4 refers to franchisee when it is actually about franchisee owners/operators. Such corrections need to be made in all the different tables in the report. In chapter 5, the levels of cost reduction used (<15% and 15-30%) are different from varying levels used in chapter 4. Similarly, the reason for cost reduction used is only 2 compared to more than 4 in chapter 4. Is there any reason for having this discrepancy?	Needed correction carried out here. The reasons for various aspects of impact are different in different contexts and need not be same or in same diversity.
13. The conclusions/policy suggestions could be more specific. Which of the competing models is better in terms of inclusiveness and which is the one in terms of efficiency of delivery and which of them is better if both have to be considered in tandem? This kind of thing needs to be mentioned more specifically in line with objectives of the study.	This has been attempted in revised report.
14. Finally, the report needs proper proof reading and English editing as it suffers from spelling and grammatical mistakes. This makes comprehending the contents difficult at stages.	Done