Accelerating Farm Incomes (AFI) Baseline Report

BUILDING SUSTAINABLE SOIL HEALTH, MARKETS AND PRODUCTIVITY IN TELANGANA STATE, INDIA

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IFDC
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Acronyms

% AI	Area Under Irrigation
AFI	Accelerating Farm Income
AFS	Average Farm Size
CSR	Corporate Social Responsibility
DAP	Diammonium Phosphate
FGDs	Focus Groups Discussions
FPO	Farmer Producer Organization
FYM	Farmyard Manure
GAPs	Good Agricultural Practices
GoI	Government of India
HH	Household
HYV	High-Yielding Variety
IFDC	International Fertilizer Development Center
KII	Key Informant Interview
LNRMI	Livelihoods and Natural Resource Management Institute
MANAGE	National Institute of Agricultural Extension Management
PUA	Peri-Urban Agriculture
SPSS	Statistical Package for Social Sciences
SSP	Single Superphosphate
STW	Shallow Tubewell
TSP	Triple Superphosphate
VIF	Variance Inflation Factor

Abstract

The baseline assessment of Accelerating Farm Incomes aims to understand existing socio-economic conditions of the farm families, crop practices, cropping systems, access to resources, and market systems. This assessment provides insights into the potential to enhance farm incomes and the constraints that need to be dealt with in the selected districts. Apart from providing some insights to facilitate appropriate interventions, it provides a good set of indicators which form the basis for monitoring and evaluation in future.

Accelerating Farm Incomes (AFI) Baseline Report Building Sustainable Soil Health, Markets, and Productivity In Telangana State, India

Executive Summary

Context

The Government of India (GoI) aims to double farmers' income during the next five years through various policies and strategies along with innovative technologies. A number of strategies are identified to promote sustainable intensification in terms of improving soil quality, applying integrated nutrient management, strengthening extension network, improving quality of livestock, promoting horticulture, etc. While most of these strategies are directed toward sustainable intensification, they are also likely to improve viability of agriculture. Apart from the government, private sector, private-public partnerships, and corporate social responsibility (CSR) initiatives are being encouraged in this direction.

The Walmart Foundation awarded the International Fertilizer Development Center (IFDC) a development project titled "Accelerating Farm Incomes (AFI): Building Sustainable Soil Health, Markets, and Productivity in Telangana State, India. This AFI project has a 34-month intervention strategy starting in October 1, 2019. It is designed to strengthen and reorient agricultural production systems in the peri-urban agriculture (PUA) and rural areas of the Telangana State, India. The AFI project is being implemented in three districts of Telangana State – Mahabubnagar, Medak, and Rangareddy. The project aims to directly and indirectly enhance the productivity of 90,000 farmers by 25% and income by U.S. $200 per year. Directly the project would cover 30,000 farming households. It will contribute substantially to technology diffusion, capacity building, and micro-enterprise development. The project is expected to achieve an immediate impact on improved yields and increased farmer income through improved resource use efficiency and linking farmers with markets.

Emphasis is on dissemination of good agricultural practices (GAPs), including improved technologies, to PUA farmers. The diffusion of improved technologies requires attention to both demand- and supply-side issues – to create farmer awareness and improve knowledge of the use and benefits of GAPs and technology (a precursor to demand growth) and concurrently to stimulate entrepreneurial investment in agro-input and quality product supply.

A baseline survey is required to understand the current demographic situation and socio-economic conditions of the farm families, including current agriculture production and soil fertility management practices, and cropping systems, as well as market requirements and existing gaps.

The baseline assessment will help identify appropriate interventions and forms the basis for monitoring and evaluation. The baseline data will be used to measure project impacts as defined by the results indicators, such as increased yields of selected crops, gross/net margins of farmers, increasing area under GAPs (use of good quality seed, balanced doses of fertilizers, and micronutrients, irrigation management, maintaining proper spacing in crop plantation, etc.), number of farmers reached by the project, and increased use of balanced fertilizers and soil amendments (micronutrients and organic soil amendments). The baseline will also help identify the existing market infrastructure and avenues in the project locations, number of markets/bazaars, trade organizations, farmer producer organizations (FPOs), supermarkets, etc. The focus will be on tracing the value chain for rice, vegetable crops, maize, and pulses.

Approach

For the purpose of the baseline survey, 1.3% of the targeted 30,000 households, i.e., 397 households, were covered in the three sample districts as per their respective size (number of farming households). As per the share of farm households, one mandal (sub-district) each in Rangareddy and Medak and two in Mahabubnagar were selected. In each mandal, villages were selected using the criteria of distance from the town/marketplace. The sample villages represent closest, farthest, and mid-reach locations (to markets). A sample of 33 households was covered in each village, keeping 10% leverage for poor responses. Accordingly, the sample size in Rangareddy district worked out to be 132,165 in Mahabubnagar and 100 in Medak. The sample is drawn in proportion to the actual distribution of farm-size classes in the sample villages to represent small, marginal, medium, and large farmers.

Both qualitative and quantitative data were collected. Qualitative data were collected at the community and village levels. Qualitative methods, such as focus group discussions (FGDs), key informant interviews (KIIs), etc., were used to capture the perceptions pertaining to GAPs at the community level (FGDs) and with local (mandal) officials, extension workers, etc. (KIIs). The analysis was carried out at two levels – village/community level and household level – for various economic (farm size) groups in order to understand differences in performance. Qualitative assessment was used to complement as well as validate the quantitative analysis. Descriptive statistics were used to assess the yield gaps of various crops. Multiple regression analysis was used to identify the factors responsible for the existing yield gaps among the farmers. Production function analysis also helped to understand the resource allocation efficiencies.

Results and Discussion

The analysis helped in understanding the context, status, potential, and constraints for improving farm incomes in the selected districts. The following is a summary of some of the important aspects in this regard. These may be taken as pointers for designing the future interventions.

1. Some of the peri-urban villages are fast becoming urban in nature, as agriculture is no longer a priority. Farmers are more interested in non-farm avenues and unlikely to continue

agriculture and learn GAPs. In fact, there may not be much cultivable land left for agriculture. While planning the interventions, the **villages need to be assessed for their interest and demand for such interventions in order to avoid inefficient use of resources.**

2. Land is not a constraining factor while water is a constraint. Water use efficiency is low, as most farmers allocate their water to water-intensive paddy crop, and they adopt flood irrigation. Though some farmers use micro irrigation (MI), it is mainly due to the subsidies they receive and area covered is marginal. **There is good scope for improving water use efficiency and crop production through promotion of less water-intensive crops. Given the scarce water conditions coupled with heavy dependence on groundwater, there is potential to promote micro irrigation in the region.**
3. Marginal and small farmers account for more than 75% of the farming households. They do not appear to have advantages in terms of access to resources, use of inputs (including labor), access to markets, etc. They no longer have the edge over medium and large farmers in terms of yield rates (land productivity). And, they are at a disadvantage position in terms of net returns. **Focusing the interventions on these farmers would provide a better return on investment.**
4. All the sample villages adopt a combination of two crop – paddy-pulses (red gram); paddy-jowar; cotton-pulses (red gram); and paddy-maize. There are no major changes in cropping pattern in recent years. Only paddy and a few vegetables are grown during rabi season and the crop intensities are about 120%. **Reallocation of water may help to increase the crop intensities. At present, area under vegetable crops is very marginal; the scope for increasing the area under vegetable, especially in the peri-urban locations, needs to be assessed and promoted for enhancing farm incomes. A shift away from paddy to low water-intensive crops with micro irrigation can substantially improve the area under protective irrigation and crop yields. Even the existing crops, such as cotton and maize, could be provided with one or two irrigations, which could enhance their productivity substantially.**
5. Present input use is highly biased toward chemical fertilizers with nominal organic (farmyard manure [FYM]) applications. **Farmers are not very familiar with using other organic manures, such as vermicompost, green manure, etc. There is a clear need for increasing the application of organic matter (at least doubling). Promoting vermicomposting and green manure preparation activities at the household level for self-consumption as well as a business model could be explored.**
6. Labor is the single largest component of the cost composition. Of late, labor has become a constraining factor in the so-called labor surplus economy. Any crop changes or technology interventions need to consider this. **That is, labor-intensive (even marginally) crop practices may not be acceptable or sustainable.** Profit gains must be substantial in order to make them adoptable.
7. Given the low share of fertilizers in the total cost composition, there is little incentive to reduce or fertilizer use or use efficient fertilizer technology. At the same time, improved soil nutrition

management could enhance productivity of some crops, such as cotton. **Building awareness among farmers might help adoption of GAPs in this regard.**

8. At the aggregate level, maize is the most profitable crop but is not grown everywhere. **Constraints for expanding the area under maize need to be explored.** However, blanket crop shifts may not be sustainable, as observed in the case of paddy and cotton in Mahabubnagar. While cotton is more profitable than paddy in all other locations, they are equal in Mahabubnagar.
9. Access to markets in the sample villages continue to be traditional (high dependence on traders and middlemen). Farmers neither use nor are aware of e-markets nor are they linked directly to urban markets or supermarkets. There are no FPOs functioning in the region. In the absence of evolved market systems, it is difficult to promote new crops, such as vegetables. **Establishing better market linkages with improved price realization is critical for improving farm incomes.**
10. The yield gap analysis indicates that there are wide variations in yields of various crops. These variations could be observed within the village, between the villages, and between the districts. This points to the potential for increasing the yield rates in the given agroecological and technological context. **Bridging the yield gaps through adoption of GAPs in the present crop systems could result in a 9% increase in household income from agriculture. This can be further increased by reallocating the area under crops. Reallocating more area to cotton from other crops or reallocating the water from paddy (by reducing the area under paddy) to other crops could further increase the net gains. Gains from the latter (reallocating water) may increase the gains from the cotton crop as well.**
11. There are wide variations in adoption of some of the GAPs across the farm households, villages, and districts. **Low rates of GAP adoption and/or wide variations in adoption across farmers indicates the potential for reducing the yield gaps.**
12. Factors explaining the variations in yield rates suggest that better soil nutrition and pest management practices could help enhance yields and incomes in crops such as cotton. Overall, there is potential for improving input management for enhanced crop performance. **GAPs need to focus on soil nutrition and pest management practices. At the same time, labor and water are the main constraints and, hence, adoption of labor- and water-saving methods and approaches would be acceptable to the farming communities.**
13. Apart from crop production, livestock rearing is a potential source of household income. In some of the sample villages, the share of livestock income in the total household income is as high as 20%. Identifying the potential and constraints for increasing the share of livestock in household income in the other villages could be a viable proposition. **Increasing livestock holdings has the dual benefits of increasing the availability of FYM (organic matter) and providing regular cash income at the household and village levels. Besides, small farmers appear to gain more from livestock rearing.**
14. Analysis of labor contribution in crop production confirms the “feminization of agriculture” argument, as women’s labor account for two-thirds of total labor use in crop production. Also,

some of the villages have substantial number of women farmers. **Women farmers/workers face different problems when compared to their male counterparts and, hence, their needs are expected to be different. Understanding their requirements and providing exclusive support (training and technologies) to them is critical for improving their conditions.**

The baseline assessment provides insights into the status and context of the three sample districts. Crop production in the sample villages is driven by resource and market constraints with little or no support from extension services. As a result, resource allocation inefficiencies and unsustainable farm practices are widespread. There is potential to increase farm income through better allocation of resources, enhancing input productivities, and greater price realization. Water use efficiency could be improved by shifting to low water-intensive crops and water-saving techniques (micro irrigation). This could be achieved within the existing cropping pattern and/or introducing new crop/farming systems that are acceptable and profitable to the farmers. Livestock farming is a viable complementary livelihood activity, which requires water, fodder, and market support. Labor availability appears to be a major constraint in these villages and, hence, any new intervention must take this into account. Improving access to markets and creating value chains need a broader policy push. Promotion of FPOs and other direct marketing arrangements at the village or cluster level could be prioritized. This would incentivize farmers to shift to non-traditional crops, such as vegetables, that are less water-intensive and more remunerative.

I Background

Agrarian distress is attributed to increasing costs in the absence of a matching rise in output prices. Crop productivity increases that are coming at the cost of higher input (chemical) use (costs) and soil mining (degradation) are recorded year after year. It is estimated that 70% of the cultivable land in India faces degradation in one form or the other. Unsustainable intensification practices, such as mono cropping, chemically intensive farming, inefficient input use practices (including water), are degrading the soils. Also, the absence of good agricultural practices (GAPs), market infrastructure, awareness and capacities, etc., are making farming unviable. Levels of organic carbon in soil are dropping across the country, making soils more vulnerable to erosion. Not only are these excesses and imbalances reducing the productivity and life of soils, they are also resulting in harmful residues in the food and vegetables. This, in turn, adversely impacts human and livestock health and increases the burden of health costs.

Large parts of India are deficient in two or more critical nutrients. In the past, farmers would plow the stalks left standing on the field after the harvest (green manure), cow dung, etc., back into the soil. This ensured that nutrients taken out of the soil were replenished. High-yielding varieties (HYV) of crops introduced through the green revolution have prompted imbalanced chemical fertilizer use. Farmers today use more and more chemical fertilizers, such as nitrogen (urea), potassium, and phosphorus, and very little organic manure, such as FYM and compost. Further, fertilizers are applied without understanding the available soil nutrients. Over the years, such imbalanced application of chemical inputs has damaged the soils although yield rates were maintained at an increasing cost (increasing quantities of fertilizer application). As a result, 2% of India's total geographical area (6.98 million hectares [ha]) has turned acidic and another 6.7 million ha has become saline (MANAGE, 2017; 2018). These soils are increasingly incapable of supporting agriculture. This calls for good soil nutrient management practices.

In order to increase crop intensity, farmers burn their fields to clear stalks left standing after the harvest to plant the next crop. Availability of FYM has declined due to mechanization and unfavorable economics of livestock rearing. That is, agriculture intensification has converted grazing lands into crop lands and only large farmers can afford keeping livestock. Also, with increasing fuel shortage, dung is used as fuel. As a result, application of FYM has fallen to less than 5 metric tons per hectare (mt/ha) against the recommended 5-10 mt/ha (MANAGE, 2017). The adverse impacts of such practices are widely recognized. Policymakers have identified that farm viability could be increased through sustainable farm practices. Widespread use of flood irrigation in dry regions has resulted in limited access to irrigation and low productivities. Market distortions, in the form of minimum support prices that are biased in favor of irrigated crops, are leading to inefficient allocation of resources.

The Government of India (GoI) aims to double farmers' income during the next five years through various policies and strategies along with innovative technologies (Chand, 2017). A number of strategies have been identified to promote sustainable intensification in terms of improving soil quality, integrated nutrient management, strengthening extension network, improving quality of livestock, promoting horticulture, technology adoption, awareness, and capacity building at the village level. While most of these strategies are directed toward sustainable intensification, they are also likely to improve viability of agriculture through promotion of GAPs. Aside from the government intervention, private sector, private-public partnerships, and CSR initiatives are being encouraged in this direction.

The Walmart Foundation Initiative

The Walmart Foundation awarded the International Fertilizer Development Center (IFDC) a development project titled "Accelerating Farm Incomes (AFI): Building Sustainable Soil Health, Markets, and Productivity in Telangana State, India. This AFI project is a 34-month intervention starting on October 1, 2019. It is designed to strengthen and reorient agricultural production systems in the peri-urban agriculture (PUA) and rural areas of the Telangana State in India. The AFI project will be implemented in three districts of Telangana State – Mahabubnagar, Medak, and Rangareddy. The project aims to directly and indirectly enhance productivity of 90,000 farmers by 25% and income by U.S. $200 per year. Directly, the project would cover 30,000 farming households. It will contribute substantially to technology diffusion, capacity building, and micro-enterprise development. Each component is crucial for sustainability of agriculture production systems. The project is expected to achieve an immediate impact on improved yields and increased farmer income through improved resource use efficiency and linking farmers with markets. AFI will focus on the following key issues for improving crop productivity in Telangana:

1. Increase productivity by expanding farmer knowledge of best production practices.
2. Ensure application of appropriate technologies (seed, fertilizers, crop protection practices, and products) to suit Telangana's marginal soils (with low nitrogen and phosphorus levels), which have severe nutrient deficiencies in semi-arid/rainfed conditions.
3. Create access to viable marketing pathways and sustainable opportunities for farmers to sell their produce and optimize their income.

Emphasis will be on dissemination of GAPs, including improved technologies, to PUA farmers. The diffusion of improved technologies requires attention to both demand and supply side issues – to create farmer awareness and improve knowledge of the use and benefits of GAPs and technology (a precursor to demand growth) and concurrently to stimulate entrepreneurial investment in agro-input and quality product supply to afford access. The implementation strategy involves focusing on and strengthening the following areas:

- Incorporating peri-urban agriculture as part of the poverty alleviation process.
- Assisting the targeted peri-urban poor in marketing of agricultural products.

- Providing training and advisory services for capacity building as part of the community empowerment process.
- Delivering specific, adaptable technology transfer toward improving the use of quality seeds, irrigation efficiency, and fertilizer management for three commodity groups, depending on the cropping pattern in the selected districts – rice-maize, rice-pulse, and rice-vegetable – based on climate-smart and resilient approaches, such as:
  - Improving nutrient use efficiency in rice-vegetable-based cropping systems.
  - Enhancing secondary and micronutrient uptake in cereal-based cropping systems, including maize, vegetables, and pulses.
  - Improving fertilizer and water use efficiency in semi-arid agriculture systems.
- Providing commercial orientation to peri-urban agriculture in Telangana State through the involvement of smallholder farmers, particularly by encouraging women and youth involvement in such initiatives.
- Recognizing the growth and demand for horticultural products (vegetables) in the metropolis of Telangana State and the potential for export opportunities with the international airport, PUA-related interventions will help smallholders access sustainable farming and income opportunities.

The project will strengthen inter- and intra-partner relationships with participating resource-poor farmers, private sector extension agents, agricultural input suppliers, and output buyers in the project areas and beyond. A system of forward and backward linkages will be established to achieve the goal of the project. The project will improve the technical capacity of private sector extension agents as well as resource-poor farmers toward the effective use of technologies. Sustainable partnerships also will be developed through participatory learning processes, such as workshops, training, field days, field visits, farmer visits, and other innovative knowledge dissemination forums, such as web-based platforms.

Baseline Survey

A baseline survey is required to understand the current socio-economic conditions of the farm families, current agriculture and soil fertility management practices, cropping systems, and understand the market requirements and gaps for the crops grown such as rice, cotton, jowar, pulses, maize, and other crops. Baseline assessment will help identify appropriate interventions and forms the basis for monitoring and evaluation. The findings of the baseline study will be used to determine baseline values for key project indicators, as well as to inform the design of project activities and areas of emphasis. The baseline will be used to measure project impacts as defined by the results indicators, such as increased yields of selected crops, gross/net margins of farmers, increasing area under GAPs (use of good quality seed, balanced doses of fertilizers, and micronutrients, maintaining proper spacing in crop planting, etc.), number of farmers covered by the project, and increased use of balanced fertilizers and soil amendments (micronutrients and organic soil amendments). The baseline will also help identify the existing market infrastructure

and avenues in the project locations, number of markets/bazaars, trade organizations, FPOs, supermarkets, etc. The focus will be on tracing of value chain for rice, cotton, red gram, jowar, maize and pulses.

The report is organized into six sections. The following section presents the approach to the baseline survey, explaining the sample survey methodology and sampling details. Section III discusses the profile of the sample villages, which is based on the qualitative research and analysis. Section IV, based on the quantitative data, examines the anatomy of agriculture in rural and peri-urban context in the sample villages. Section V looks at the potential and constraints for accelerating farm incomes in the sample villages going by the yield variations and farming practices. And Section VI summarizes the analysis and presents the way forward for accelerating farm incomes.

II Approach

Sample Survey and Methodology

The project interventions are targeted to cover 30,000 farmers (beneficiary households). There are more than 1,400 villages covered under 73 mandals (sub-districts) in the three project districts (Table 1). The average size of the villages in the project districts is less than 300 cultivating households. In order to cover 30,000 farmers, the project interventions would need to cover 24 mandals and 471 villages (Table 2). Farm population is used as criteria for distributing the mandal among the three sample districts. That is, the number of mandals in each district is distributed according to the respective share of the district in terms of farm households. As per the secondary data, 35% of the 24 mandals fall in Rangareddy district, 40% in Mahabubnagar, and 25% in Medak (Table 2).

Table 1. Demographic Features of the Selected (Project) Districts

District	No. of Rural HHs	Total Rural Population	No. of Mandals	No. of Villages	No. of Cultivating HHs	HH Size
Medak	141,715 [25]	708,574	20	378	99,200 (262)	5
Rangareddy	205,222 [35]	1,026,114	27	497	143,655 (289)	5
Mahabubnagar	235,714 [40]	1,178,574	26	559	165,000 (295)	5
Telangana State	5,169,029	21,395,009	584	9,834	3,618,320 (368)	4

Note: Figures in '[]' are proportion of rural households to total of three project districts.
Figures in '()' are the number of cultivating HHs per village.

Table 2. Project Intervention Scale and Baseline Sample Coverage

District	Project Intervention Scale				Baseline Sample Coverage		
	No. of Farming HH	Total Rural Population	No. of Mandals	No. of Villages	No. of Sample Mandals	No. of Sample Villages	No. of Sample HHs
Medak	7,500 [25]	37,500	6	132	1	3	100
Rangareddy	10,500 [35]	52,500	8	129	1	4	132
Mahabubnagar	12,000 [40]	60,000	10	210	2	5	165
Total	30,000 [100]	150,000	24	471	4	12	397

Note: Figures in '[]' are proportion of rural households to total of three project districts.
Figures in '()' are the number of cultivating HH per village.

For the purpose of the baseline survey, it is proposed to cover at least 1.3% of the targeted 30,000 households, i.e., 397 households. These 397 households are distributed among the three sample districts as per their respective size (number of farming households). Accordingly, the sample size works out to be 132 in Rangareddy district, 165 in Mahabubnagar, and 100 in Medak. Using the small (minimum) sample principle of 30 minimum sample households in each village, it is proposed to cover 12 villages from the three districts. This minimum sample ensures scientific and robust assessments. Depending upon the size of the sample in each district, the 12 villages are selected from four mandals. As per the share of farm households, one mandal each in Rangareddy and Medak and two mandals in Mahabubnagar were selected. In each mandal, villages were selected using the criteria of distance from the town/marketplace. The sample villages represent closest, farthest, and mid-reach locations (to markets). A sample of 33 households is covered in each village, keeping 10% leverage for poor responses. The sample is drawn in proportion to the actual distribution of farm size classes in the sample villages to represent small, marginal, medium, and large farmers (Table 3). In total, the sample covered 45% of marginal farmers, followed by 32% small, 17% medium, and 6% large farmers. Medak and Rangareddy districts have a greater proportion of small and marginal farmers. In some mandals, there were no large farmers in the sample or at all, while in some there were absentee large farmers (Gajulapeta).

Table 3. Baseline Survey: Household Sample Details

Sample District/ Mandal/Village	No. of Sample Farmers				Total Sample HH
	Marginal	Small	Medium	Large	
Medak	79 (1,070)	13 (179)	6 (88)	1 (12)	99 (1,349)
Manoharabad**	79 (1,070)	13 (179)	6 (88)	1 (12)	99 (1,349)
Lingareddipet	26 (266)	4 (44)	3 (27)	0 (0)	33 (337)
Jeedipally	28 (323)	4 (46)	1 (15)	0 (0)	33 (384)
Kallakal	25 (481)	5 (89)	2 (46)	1 (12)	33 (628)
Rangareddy	69 (451)	36 (194)	20 (127)	8 (46)	133 (818)
Farooqnagar+++	69 (451)	36 (194)	20 (127)	8 (46)	133 (818)
Gantlavelli	19 (60)	8 (27)	4 (12)	2 (6)	33 (105)
Chattanpalle	12 (25)	14 (30)	5 (10)	2 (4)	33 (69)
Mogalagidda	20 (145)	6 (42)	5 (36)	2 (16)	33 (239)
Bhemaram	18 (221)	8 (95)	6 (69)	2 (20)	34 (405)
Mahabubnagar	31 (1,394)	77 (3,448)	43 (1,199)	15 (498)	166 (6,539)
Mahabubnagar (Rural)	19 (1,194)	59 (3,148)	17 (884)	5 (373)	100 (5,592)
Zainallipur+	4 (40)	20 (180)	6 (50)	3 (30)	33 (300)
Gajulapeta++	7 (565)	20 (1555)	6 (481)	0 (226)@	33 (2,827)
Kotakadira	8 (589)	19 (1413)	5 (353)	2 (117)	34 (2,472)
Krishna* (Hindupur)	12 (200)	18 (300)	26 (315)	10 (125)	66 (940)
Mudumal	10 (180)	15 (270)	7 (115)	1 (25)	33 (590)
Chegunta	2 (20)	3 (30)	19 (200)	9 (100)	33 (350)
All	179 (2,915) [45]	126 (3,821) [32]	69 (1,414) [17]	24 (556) [6]	397 (8,706) [100]

Note: Figures in '()' are actual number of households i.e., population. Figures in '[]' are relative share i.e., % in the sample.

*Formerly Maganoor Mandal; **Formerly Toopran Mandal; +Formerly Hanwada Mandal; ++Formerly Addakal Mandal; +++Formerly Mahabubnagar District; @Absentee Land Owners/Non-Cultivating HH.

Both qualitative and quantitative data were collected. Qualitative data were collected at the community and village levels. Qualitative methods like focus group discussions (FGDs), key informant interviews (KIIs), etc., were used to capture the perceptions pertaining to GAPs at the community level (FGDs) and with local (mandal) officials, extension workers, etc. (KIIs) (Photo 1).

Photo 1. Focus Group Discussions in the Village and KIIs at the Mandal Office

Photo 2. Piloting of Questionnaire and Visits to Field

Quantitative data were collected at the household level using a structured questionnaire. The household questionnaire had two components (see Appendix: Questionnaire): a socio-economic component, including demographic data, income and expenditure of farmers, farmer willingness and ability to pay for quality inputs, and current marketing practices, and a technical component, including cropping patterns/systems, agro-input use, yields, soil and crop nutrient management knowledge and practices, and agricultural production practices, market structure, etc., for the

selected crops. The questionnaire was piloted prior to its finalization (Photo 2). Based on the pilot and feedback from the pilot visit to the village, the questionnaire was modified and finalized.

To carry out the survey, a group was chosen; 15 enumerators for data collection at the household level were identified and formed into teams under team coordinators. The entire group was given training on the questionnaire (Photo 3). Data were entered on smartphones using the data entry format. The data manager provided the data entry format on smartphone and gave training on data entry. Enumerators were formed into teams to cover each district simultaneously.

Photo 3. Training Session for the Investigators

Scrutiny and Analysis

Data collection was monitored by the field coordinators for quality assurance as well as to clarify any issues. Data collected on the smartphone app was transferred directly to the data manager through a server on a daily basis. Data was later transferred to the Excel format. The data manager checked the data for any inconsistencies, missing data, outliers, etc., and provided the feedback to the respective enumerators on a daily basis. Once all the data was collected, a thorough checking and cleaning of data was carried out using Excel prior to the analysis. In the process, the data was cross-verified using different responses of the farmer within the questionnaire. Tabulation formats were prepared and tabulation was carried out accordingly. The analysis was primarily based on the cross-tabulation of data and graphic presentations. The analysis was carried out for various economic (farm size) groups in order to understand differences in performance. Qualitative assessment was used to complement as well as validate the quantitative analysis. Descriptive statistics were used to assess the yield gaps of various crops. Production functions were estimated using multiple regression analysis using SPSS software to identify the factors responsible for the existing yield gaps among the farmers. Production function analysis also helped to understand the resource allocation efficiencies.

III Profile of the Sample Villages

This section is based on the village-level information collected from the village community through FGDs and KIIs and the quantitative information gathered from the mandal offices.

Rural and Peri-Urban

Of the sample villages, 50% are peri-urban. Peri-urban locations are defined in terms of closeness to markets, extent of cultivated land, linkages with urban markets, and dependency on the urban income-generating avenues. Given the closeness of the sample districts to the mega city of Hyderabad, some of the sample villages are quickly turning into urban settlements and busy with urban activities such as real estate (Table 4). **In fact, our discussions with the village community indicated that two of the sample villages in Medak are left with very little cultivable land (Table 5). In these villages, farmers may have limited interest in continuing in agriculture and learning GAPs. Given the fact that Medak is close to Hyderabad, these villages reflect the fast-paced urbanization taking place in the district and represent the peri-urban district, which will be a reality soon. While planning the interventions, the villages need to be assessed for their interest and demand for such interventions in order to avoid inefficient use of resources.** All the peri-urban locations are within 10 kilometers (km) from market centers (towns). The average size of the sample villages ranged between 260 and 1,225 households. The average size of the peri-urban locations is high when compared to rural locations.

Table 4. Demographic Profile of the Sample Villages

District	Village	Character	Distance to Market (km)	# of Households
Medak	Lingarddpet	Peri-urban	4	260
Medak	Jeedipally	Peri-urban	8	365
Medak	Kallakal	Peri-urban	10	1,225
Rangareddy	Mogiligidda	Peri-urban	9	1,120
Rangareddy	Bheemaram	Rural	18	289
Rangareddy	Gantlavelly	Rural	13	257
Rangareddy	Chattanpally	Peri-urban	1	911
Mahabubnagar	Chegunta	Rural	45	350
Mahabubnagar	Mudumal	Rural	35	726
Mahabubnagar	Gajulapeta	Rural	12	663
Mahabubnagar	Kotakadira	Rural	22	484
Mahabubnagar	Jainallipur	Peri-urban	06	280

In most of the sample villages, marginal and small farmers (<5 acres) account for more than 70% of the farmers (Table 5). The only exception is Chegunta village (Mahabubnagar), where 85% of the farmers belong to the medium and large categories, which is not usual. It is interesting to note that Chegunta village has highest proportion of scheduled caste households that are medium and large farmers (>5 acres of land). Chegunta appears to be a special case. **Overall, marginal and small farmers are the main target of the proposed interventions.**

Table 5. Economic Classification of the Households in the Sample Villages

Village	Marginal	Small	Medium	Large	All
	(%)				(no.)
Kallakal	77	14	7	2	628
Jeedipally	84	12	4	0	384
Lingareddipet	79	13	8	0	337
Medak	79	13	7	1	1,314
Gantlavelli	57	26	11	6	105
Mogalagidda	61	18	15	7	239
Bhemaram	55	23	17	5	405
Chattanpalle	36	43	14	6	69
Rangareddy	55	24	16	6	818
Chegunta	6	9	57	29	350
Gajulapeta	20	55	17	8	2,827
Mudumal	31	46	19	4	590
Kotakadira	24	57	14	5	2,472
Zainallpur	13	60	17	10	300
Mahabubnagar	21	53	18	8	6,539
All (no.)	2,915	3,821	1,414	556	8,706

Natural Resources

Access to natural resources, such as land and water, is critical for enhancing farm incomes. All of the sample villages except two have more than 500 acres of land, ranging from 76 to 6,492 acres. Mahabubnagar villages have larger cultivated lands, followed by Rangareddy and Medak villages (Table 6). More detailed information on land and water resources is presented in Table A1. The majority of the households own their land. Only in Chattanpalle of Rangareddy district, 77% of the households do not own their own land. The proportion of households that do not own land is less than 10% in majority of the sample villages. Given the semi-arid nature with about 800 mm rainfall, irrigation plays an important role in crop production. All of the sample villages are dependent on groundwater or stream water (lift irrigation), as only one village (Mudumal) has a canal as a source of irrigation. Availability of irrigation varies widely across the sample villages. Sample villages in Medak have the highest proportion of irrigation (58%), and Rangareddy villages have about 10% of area irrigated on average. One of the sample villages (Chegunta) in Mahabubnagar had the lowest area under irrigation (2%), while Mudumal had the highest area under irrigation (71%). The high proportion of area under irrigation in Mudumal village is due to the availability of canal waters, accounting for 60% of the irrigated area in the village. All other sample villages depend on bore wells or streams, which are dependent on rainfall and, hence, face uncertain agrarian conditions. Crop failures are common. Income from livestock is also a major source in most of the sample villages. All of the sample districts depend on migrant labor (nearby towns) to supplement agricultural income. Mahabubnagar has the high incidence of migration[1] to

[1] Migration in Mahabubnagar villages ranges between 40% and 50% of the total working population. In recent years, the extent of migration has decreased due to the advent of irrigation (Korra, 2011).

far off places, such as Mumbai. Mahabubnagar is known for out-migration for quite some time. Perhaps due to this, the sample villages in Mahabubnagar had higher proportion of women farmers (Table 6). **These villages may need to focus on women farmers as well. Women farmers face different problems when compared to their male counterparts, and hence their needs are expected to be different. Understanding their requirements and providing exclusive support (training) to them is critical for improving their conditions.**

Table 6. Status of Agriculture in the Sample Villages

Village Name	Total Cultivated Land (acres)	Landless Households (%)	Area Irrigated (%)	Source of Irrigation	Groundwater (%)	Canal (%)	Women Farmers (%)
Lingarddpet	104	7	58	Bore wells	100	0	3
Jeedipally	76	6	58	Bore wells	100	0	1
Kallakal	502	24	57	Bore wells	100	0	1
Mogiligidda	1,849	18	8	Bore wells	100	0	1
Bheemaram	1,191	7	7	Bore wells	100	0	2
Gantlavelli	585	16	9	Bore wells	100	0	6
Chattanpally	436	77	22	Bore wells	100	0	0
Chegunta	3,565	14	2	Bore wells	100	0	9
Mudumal	6,492	10	71	Canal/well	40	60	8
Gajulapeta	2,276	6	9	Bore wells	100	0	8
Kotakadira	2,500	10	48	Bore wells	100	0	8
Jainallipur	870	9	51	Bore wells	100	0	7

Source: Mandal revenue offices of the respective mandals.

Access to land and water determines the nature, diversity, and intensity of cropping pattern. In all of the sample villages, both kharif and rabi crops are grown (Table 7). While five crops are sown during kharif, three crops are sown during rabi season. In the case of Chegunta village (Mahabubnagar) where only 2% of the area is under irrigation, only one rabi crop is grown (white jowar). Lack of access to irrigation in Chegunta may explain the dominance of scheduled caste community with large land holdings. In Medak and Rangareddy sample villages, even a summer crop is grown (fodder). Farmers give first preference to paddy when they have access to water. Maize, cotton, and jowar are second preference crops, followed by pulses and vegetables. **Despite the high potential for vegetable crops, especially in peri-urban villages, farmers are not very familiar with growing vegetables. However, they have started trying vegetable crops. With some support regarding awareness, technologies, and market connectivity, the potential for growing vegetable crops would expand.** In Chegunta, paddy is the last preference. In all the sample villages, paddy, cotton, pulses (red gram), maize, and vegetables are the most preferred crops during kharif season. Paddy is the first preference during rabi in the majority (seven) of the sample villages. Pulses, vegetables, and fodder are the next preferred crops during rabi. Only fodder is grown during summer months. Over the last five years, not many changes have been observed in the cropping pattern of the sample villages. While paddy and fodder crops are constant, the combination of other crops (maize , jowar, cotton, pulses, and vegetables) keep changing. Only

farmers in Mudumal reported shifting away from sunflower in favor of paddy and red gram. **Otherwise, no major changes in cropping pattern have been observed in the sample villages.**

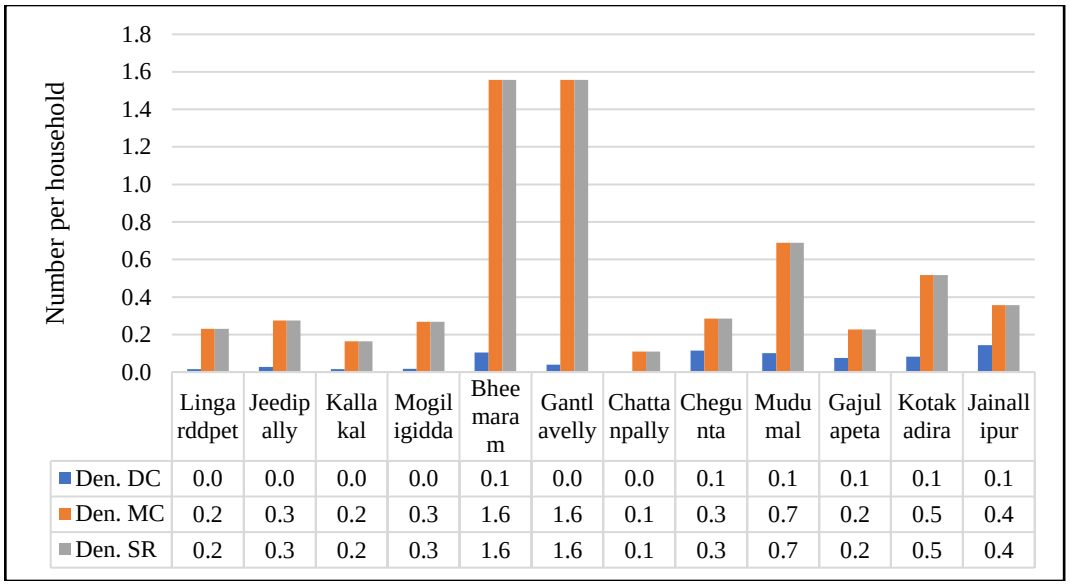
Table 7. Cropping Pattern in the Sample Villages

Village	Kharif					Rabi			Summer
	1	2	3	4	5	1	2	3	1
Lingarddpet	Paddy	Maize	Cotton	Tomato	Brinjal	Maize	Paddy	Fodder	Fodder
Jeedipally	Paddy	Maize	Bhendi	-	-	Paddy	Maize	Fodder	Fodder
Kallakal	Paddy	Maize	Tomato	Red Gram	-	Paddy	Bengal Gram	Vegetables	Fodder
Mogiligidda	Cotton	Maize	Paddy	Red Gram	Vegetables	Paddy	Bengal Gram	Fodder	Fodder
Bheemaram	Cotton	Paddy	Vegetables	Maize	Red Gram	Paddy	Vegetable	Fodder	Fodder
Gantlavelli	Maize	Paddy	Cotton	Vegetables	Fodder	Paddy	Vegetable	Fodder	Fodder
Chattanpally	Paddy	Maize	Asparagus	Fodder	-	Paddy	Asparagus	Fodder	Fodder
Chegunta	Cotton	Jowar	Green Gram	Red Gram	Paddy	White Jowar	-	-	-
Mudumal	Paddy	Cotton	Red Gram	Maize	Castor	Paddy	Groundnut	-	-
Gajulapeta	Paddy	Jowar	Red Gram	Groundnut	Maize	Groundnut	Paddy	Vegetables	-
Kotakadira	Paddy	Jowar	Red Gram	Castor	-	Groundnut	Paddy	Onion	-
Jainallipur	Paddy	Jowar	Red Gram	Maize	Cotton	Paddy	Groundnut	Vegetables	-

Note: Vegetables are mentioned when a number of mixed vegetables are sown.

Livestock

Livestock is an important activity associated with agriculture, as they are interdependent. While livestock provides draft power, manure, and nutrition, milk, and milk products to the rural sector, agriculture provides fodder to the livestock. The composition and density of livestock determines the energy contribution of livestock to farming and the availability of FYM in the village. The composition of livestock in the sample villages favors milch cattle and small ruminants (Fig. 1). In most of the sample villages, the density of draft power is close to zero. In fact, our discussions with the farmers indicated that draft cattle have been declining over the years due to mechanization. The density of milch cattle and small ruminants has risen in recent years due to their increased economic contribution. Households depend on the income from the regular sale of milk. Small ruminants are used for penning as well as income from their sale (meat). The higher density of small ruminants is also due to the state subsidy given to some communities. The density of small ruminants tends to be greater in the sample village where livestock-rearing community is present. The average density of milch cattle and small ruminants is around two to three per household in most villages. Two of the sample villages in Rangareddy have the highest density of animals per household at 1.5.



	Lingarddpet	Jeedipally	Kallakal	Mogiligidda	Bheemaram	Gantlavelly	Chattanpally	Cheguta	Mudumal	Gajulapeta	Kotakadira	Jainallipur
Den. DC	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Den. MC	0.2	0.3	0.2	0.3	1.6	1.6	0.1	0.3	0.7	0.2	0.5	0.4
Den. SR	0.2	0.3	0.2	0.3	1.6	1.6	0.1	0.3	0.7	0.2	0.5	0.4

Note: Den. DC = Density of Draft Cattle; Den. MC = Density of Milch Cattle;
Den. SR = Density of Small Ruminants.

Figure 1. Composition and Density of Livestock Population in the Sample Villages

Agricultural Input Use

Agricultural practices indicate and determine various aspects of agriculture. These practices include land preparation, crop, irrigation, input use, etc., which influence the viability and sustainability of farming. Adoption of good practices help farmers to sustain land quality over time. At the same time, viability and profitability of agriculture may depend on the short-term market conditions (input as well as output). For instance, high labor (including animal labor) costs may prompt use of machinery in the place of draft power, and the availability of cheap fertilizers may lead to imbalanced use of organic and inorganic matter. Increasing farm incomes must balance good practices and the farmers' objective of profit maximization. In the sample villages, machine power (tractors) is used for land preparation. Draft power has been reduced to ensure timely operations; it is also uneconomical to maintain draft power. Tractor ranges from 75% to 100% in the sample villages (Fig. 2). The use of draft power is on the higher side in the Rangareddy sample villages.

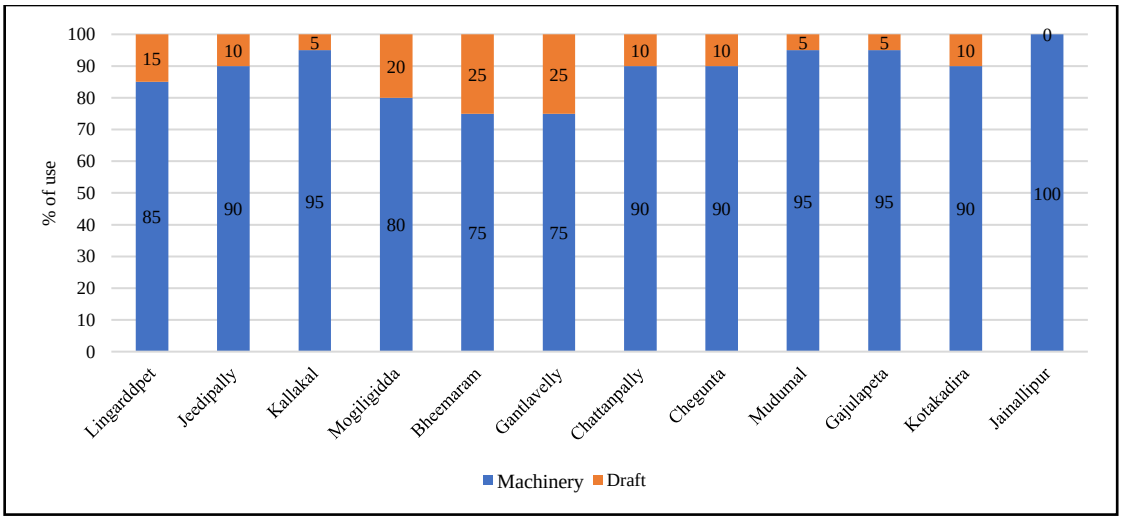
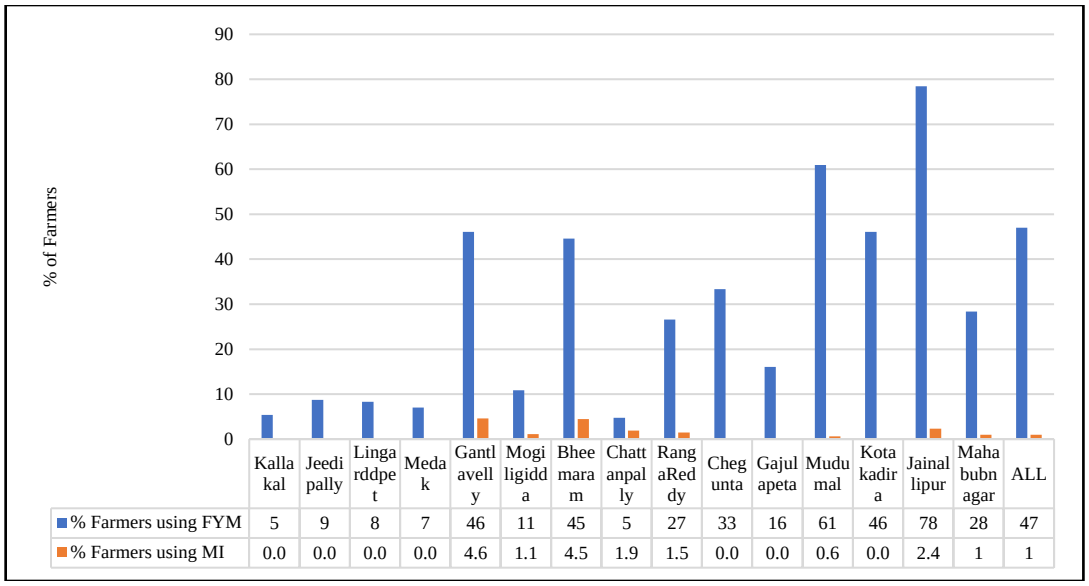


Figure 2. Use of Draft and Machine Power in the Sample Village

The decline in draft power is compensated by the increased number of milch cattle and small ruminants. About 47% of the farmers use FYM, or penning, though the proportions vary across sample villages (Fig. 3). Mahabubnagar has the highest proportion of farmers using FYM, followed by Rangareddy (27%) sample villages, while only 7% of Medak farmers use FYM. All of the farmers use chemical fertilizers and pesticides. They do not use either vermicompost or organic pesticides, such as neem oil. Very few farmers in the sample villages (<1%) use micro irrigation (Fig. 3). Adoption of micro irrigation is seen only in Rangareddy district sample villages and two sample villages of Mahabubnagar. At the aggregate level, the adoption level is just 1%. **Given the water scarcity coupled with heavy dependence on groundwater, there is much potential to promote micro irrigation in the sample region.** Even the limited adoption of micro irrigation is due to the subsidies and promotion of drip irrigation in the horticulture programs. Despite the promotional activities, adoption of drip irrigation is marginal and the area under horticulture (fruit) crops is very limited, e.g., only 40 acres of mango gardens are reported in Mahabubnagar district (Jainallipur).



	Kallakal	Jeedipally	Lingarddpet	Medak	Gantlavelly	Mogiligidda	Bheemaram	Chattanpally	RangaReddy	Chegunta	Gajulapeta	Mudumal	Kotakadira	Jainallipur	Mahabubnagar	ALL
% Farmers using FYM	5	9	8	7	46	11	45	5	27	33	16	61	46	78	28	47
% Farmers using MI	0.0	0.0	0.0	0.0	4.6	1.1	4.5	1.9	1.5	0.0	0.0	0.6	0.0	2.4	1	1

Figure 3. Use of FYM and Adoption of Micro Irrigation in the Sample Villages

Access to Markets

Input and output markets are instrumental in ensuring crop yields and incomes. Access to quality inputs at reasonable prices and the correct advice on application of appropriate inputs helps in protecting the crops at reasonable costs, and access to product markets ensures getting the right price for the produce. Access to information and markets is necessary for enhancing farm incomes. Farmers in only one-third of the sample villages reported that they rely on an agricultural extension network for information and advice on input use, while in others they take the advice of input dealers or make their own decisions. Going by the previous experience, the dependence on input dealers has lessened substantially in the region (Uday et. al., 2020). This may be attributed to the improved extension services in Telangana in the recent years. However, in all the villages, farmers buy all their inputs from the dealers, as there are no other avenues like FPOs to buy their inputs. Of late, some of the FPOs in India are actively involved in input business (Reddy et al., 2019). However, in the case of output, **farmers in 10 out of 12 villages sell their produce to middlemen**. Farmers in only two villages take their produce to the agriculture markets. These two villages (Chegunta and Mudumal in Mahabubnagar district) are the farthest from the markets. Perhaps middlemen avoid traveling to distant places for buying their produce to cut transportation costs. Farmers have reported that selling in agricultural markets involves a lot additional costs, such as transportation, labor, commission, etc. They also do not receive prompt payment. Lately, the state government is trying to streamline the process to encourage farmers to bring their produce to the markets.

IV Anatomy of Agriculture: Dynamics and Drivers

This section discusses on the household-level information pertaining to various aspects of farming, such as technical aspects (land preparation, irrigation methods, input use, etc.), economic aspects (returns to agriculture and allied activities), social aspects (differences between economic groups), and markets (access and constraints of input and output markets). Most of these practices and the associated impacts largely depend on the economic status or farm size of the household. Economic status is also determined by the nature of house as well as other facilities (Tables A2 to A5). About 60% of the households own cement houses. All of the houses have electricity, while about 60% of the houses have tap water connections. Medak has the highest proportion of households with tap connections (78%), Rangareddy villages have the lowest proportion of households with tap connections (54%), and 63% of the houses in Mahabubnagar have tap connections (Table A2). More than 90% of the households use private toilets, with 100% of households in Rangareddy villages and about 90% in Medak and Mahabubnagar (Table A3). Households possess agriculture implements and other household assets (Tables A4 and A5). Awareness about nutrition is low, as only 44% of the households reported awareness about nutrition (Table A6).

Agricultural practices differ across farm size class and economic status, as some of the practices like crop choices, input use, energy use, access to credit, etc., depend on the ability of the household to adopt. The larger the farm size, the greater the possibility of adopting GAPs. These variations can be observed within and between the villages. Similarly, households' ability to adopt GAPs is also linked to access to irrigation, since irrigation enhances the land and labor productivity. As mentioned previously, marginal and small farmers account for more than 70% of the sample households.

Given the objective of accelerating the farm and allied sector income of the households, it is important to assess the present contribution of various sectors to household income. Income from agriculture (crop production) contributes less than 50% in the majority (nine out of 12) of the sample villages. Contribution of agriculture ranges between 24% to 77% (Table 8). Medak has the lowest contribution (33.6%), followed by Rangareddy (39.7%) and Mahabubnagar (53.5%). Peri-urban villages have the lowest contribution from agriculture. When livestock is added, the contribution is above 40% in the majority of the villages. In all of the peri-urban villages, the share of employment income is as much as or higher than agriculture. The contribution of welfare programs is also substantial in number of villages, ranging between 9% and 18.5%. The contribution of welfare is higher in rural locations due to the farmer-based programs, such as *Rytu Bhandu*.[2] Within the rural areas, the contribution of agriculture varies widely, indicating the potential for increasing the incomes from crop and livestock production. On the other hand, the low contribution of agriculture in some villages indicates that it may not receive much of farmers' attention given its limited contribution to household income. There is a need to understand the

[2] Under this program, each farmer gets a cash transfer of Rs. 10,000 per acre per year.

constraints and contributing factors responsible for the poor contribution of crop and livestock production.

Table 8. Income by Source in the Sample Villages (%)

Village	Agriculture	Livestock & Poultry	Employment	Business	Pension	Government Welfare Programs	Others*
Kallakal	24.2	14.3	42.7	5.3	2.3	9.4	1.8
Jeedipally	33.4	10.2	41.6	4.4	3.7	6.4	0.4
Lingareddipet	45.4	3.0	34.9	0.0	3.8	10.2	2.6
Medak	**33.6**	**9.6**	**40.0**	**3.4**	**3.2**	**8.6**	**1.6**
Gantlavelli	26.2	21.0	26.2	7.8	4.1	9.3	5.4
Mogalagidda	54.5	19.4	10.0	0.0	6.7	9.3	0.0
Bhemaram	39.7	6.1	23.8	10.2	5.6	13.3	1.3
Chattanpalle	36.6	10.4	23.9	9.7	3.8	15.2	0.3
Rangareddy	**39.7**	**14.3**	**20.8**	**6.8**	**5.0**	**11.9**	**1.6**
Chegunta	76.8	0.6	1.6	0.0	1.6	19.5	0.0
Gajulapeta	36.8	6.8	22.0	6.5	4.6	17.7	5.8
Mudumal	63.0	0.2	5.9	1.9	6.0	22.9	0.0
Kotakadira	37.9	2.9	28.8	6.5	3.5	19.0	1.3
Zainallpur	33.6	2.1	40.2	0.0	2.4	14.3	7.3
Mahabubnagar	**53.5**	**2.1**	**17.8**	**2.3**	**3.1**	**18.5**	**2.6**

Note: * Includes village services carpentry, barber, washer men, etc.

While the contribution of agriculture to household income is associated with farm size, it is not influenced by the proportion of area under irrigation. Mahabubnagar has a higher average farm size (4.64 acres) with a low proportion of area under irrigation (39.4%) when compared to Medak and Rangareddy districts (Table 9). The lower proportion of irrigation in Mahabubnagar is reflected in low cropping intensity. In fact, Chegunta village in Mahabubnagar district has the highest contribution from agriculture as well as highest household income. While it has highest average farm size (AFS), it has the lowest proportion of area under irrigation (% AI). Households in the community revealed that though they grow only one rainfed crop (cotton, jowar, or red gram), they receive a good income due to higher market prices for cotton and red gram coupled with good yields. Households in villages using irrigation grow mostly paddy. Also, because groundwater is the main source of irrigation and is dependent on local rainfall and recharge, access to irrigation is not guaranteed all the time.

The low share of agricultural income in Medak villages could be because the share of income from employment is as high as 40%, due to its 100% peri-urban characteristics. In Rangareddy, employment and livestock contribute substantially. In the context of peri-urban locations, unless income from crop production increases substantially, households tend to neglect agriculture as a secondary source of income. Average household income is higher for large farmers in Mahabubnagar and Rangareddy districts, while small farmers have higher incomes in Medak district (Fig. 4). This could be due to their involvement in the labor (wage incomes) in the nearby urban markets.

Table 9. Average Farm Size (acres) and Percentage of Area Irrigated of Sample Households by Economic Group

Village	Marginal		Small		Medium		Large		All		
	AFS	% AI	AFS	% AI	AFS	% AI	AFS	% AI	AFS	% AI	CI
Kallakal	1.42	45.6	3.80	90.0	5.43	49.0	10.50	57.1	2.30	52.9	107
Jeedipally	1.18	79.0	3.50	100.0	6.00	100.0	0	0	1.61	82.2	130
Lingareddipet	1.19	81.5	3.76	75.0	6.50	52.2	0	0	1.83	78.9	122
Medak	**1.24**	**69.4**	**3.47**	**88.5**	**5.27**	**60.5**	**6.00**	**57.1**	**1.79**	**71.3**	**118**
Gantlavelli	1.59	52.7	4.13	55.0	6.63	58.3	11.50	22.7	3.41	52.1	138
Mogalagidda	1.52	65.0	3.81	70.8	6.35	66.4	12.01	100.0	3.31	68.4	135
Bhemaram	1.69	22.2	3.91	30.8	7.32	17.2	15.50	21.6	4.02	23.3	107
Chattanpalle	1.93	30.8	3.73	67.9	8.30	92.5	12.00	68.2	4.20	57.3	109
Rangareddy	**1.65**	**44.3**	**3.76**	**57.2**	**6.32**	**56.5**	**11.44**	**53.1**	**3.50**	**50.1**	**121**
Chegunta	2.07	0.0	4.40	0.0	6.33	5.3	16.22	0.0	8.59	03.0	101
Gajulapeta	1.37	42.9	3.22	38.3	6.42	43.3	0	0	3.41	40.2	117
Mudumal	1.66	25.0	3.37	42.2	7.37	69.0	12.00	100.0	4.31	47.1	126
Kotakadira	1.74	50.0	3.54	60.2	7.14	100.0	11.10	100.0	4.11	66.2	108
Zainallpur	1.70	0.0	3.35	41.7	6.32	50.0	12.55	100.0	4.20	40.4	127
Mahabubnagar	**1.65**	**30.0**	**3.27**	**43.6**	**6.01**	**39.6**	**14.07**	**35.7**	**4.64**	**39.4**	**113**
All	1.47	53.1	3.43	52.2	6.04	45.9	12.81	42.7	3.55	50.9	116

Note: AFS= Average Farm Size; % AI= Percentage of Area Irrigated; CI= Cropping Intensity.

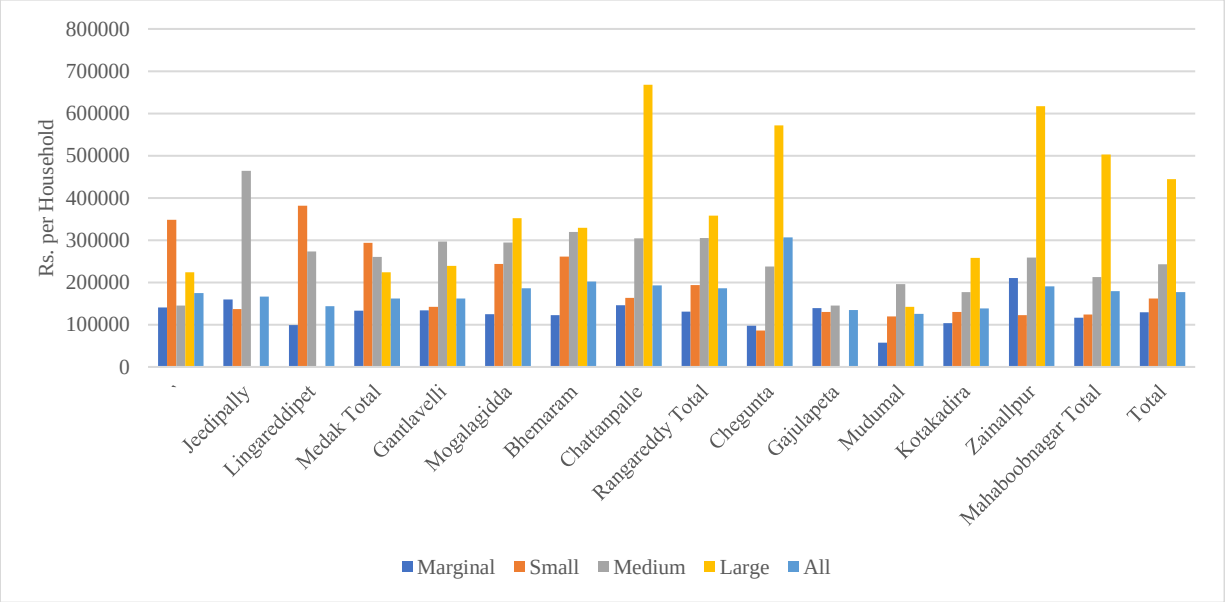


Figure 4. Average Household Income of Sample Households by Socio-Economic Groups (in Rs./HH)

Crop Profiles

On average, farmers grow one to two crops in all the sample villages, though a few medium and large farmers grow three crops (Table A7). Major crops grown in the region are paddy, cotton,

jowar, red gram, maize and castor.[3] Paddy accounts for 37% of the gross area, followed by cotton (24.4), jowar (19%), red gram (7.6%), maize (4.9%), and castor (2.4%) (Table 10). Paddy is the only crop grown in all the sample villages. Jowar and red gram are the most popular crops after paddy in the sample villages. Maize and castor are grown in few villages. Medak and Rangareddy villages grow mainly paddy and jowar; Mahabubnagar villages grow paddy and cotton. Very few villages in Medak and Rangareddy districts grow vegetable and fruit crops and that is on a very limited area of about 20 acres (Table A2). Paddy is grown under irrigated conditions in kharif as well as rabi (depending on the availability of water) in all the villages, and other crops are grown under rainfed conditions in kharif (June-October). The main source of irrigation is bore wells and stream water (Table A8). Vegetables and fodder are also grown in rabi although limited. There are no differences in cropping patterns across farm-size classes. The cropping pattern indicates that the limited water resources available are allocated to paddy, which may be an inefficient allocation of resources. Also, all of the farmers use flood irrigation, and there is no practice of micro irrigation in the sample villages. The same water could be reallocated to irrigated dry crops, such as cotton, vegetables, etc., on larger area and achieve a higher output (ACIAR, 2015). For instance, in Chegunta village, farmers allocate more than 80% of their area to cotton and derive the highest average household income. **This clearly indicates the scope for reallocating water to increase farm income through choosing appropriate crops and methods of irrigation. Shifting away from paddy[4] to low water-intensive crops with micro irrigation can substantially improve the area under protective irrigation crop yield. Even the existing crops like cotton, maize, etc., could be provided with one or two irrigations, which would enhance their productivity substantially.**

Table 10. Area under Crops in the Sample Villages during Kharif and Rabi (%)

District	Crops					
	Paddy	Cotton	Jowar	Red Gram	Maize	Castor
Kallakal	45.8	0	35.9	6.8	11.1	0
Jeedipally	75.9	0	13.4	1.9	7.2	0
Lingareddipet	71.5	1.2	18.9	2.6	0	0
Medak	65.0	0.4	22.4	3.7	5.6	0
Gantlavelli	39.4	0	6.8	0	42.9	0
Mogalagidda	57.0	20.0	13.5	3.6	0	0
Bhemaram	19.4	21.2	51.0	2.0	0	0
Chattanpalle	26	2.0	55	2.0	0	0
Rangareddy	34.7	11.1	32.4	1.9	10.6	0
Chegunta	1.6	81.3	1.4	15.7	0	0
Gajulapeta	34.5	13.7	18.4	15.8	0	4.1
Mudumal	46.9	42.1	0	11.0	0	0
Kotakadira	64.3	0	5.4	10.5	0	18.2

[3] Vegetable are grown on a very small scale among the sample households; hence, vegetable are not a major crop. Vegetables account for less than 1% of area. In the qualitative research, farmers did mention vegetable crops during summer under wells. In our sample households, a total area of 15 acres was under vegetable crops, including seven varieties. Vegetables are grown only in three villages of Medak and three villages of Rangareddy.

[4] Micro irrigation can be used even on paddy (personal communication with Dr. Yashpal Singh Sheharawat).

District	Crops					
	Paddy	Cotton	Jowar	Red Gram	Maize	Castor
Zainallpur	33.1	3.8	40.3	5.2	6.9	6.4
Mahabubnagar	30.2	38.8	10.6	12.1	1.2	4.4
All	36.6	24.4	19.3	7.6	4.9	2.4

Land Preparation and Sowing

Land preparation is the starting point for adopting GAPs at the farm level. Understanding the soil quality and identifying the appropriate methods of cultivation is critical for achieving better yields and incomes. Soil testing in Telangana State is a recent phenomenon and has yet to become popular with the farmers. Across the sample villages, 1-5% of the sample farmers have had their soils tested in 11 out of the 12 sample villages (Table A10). These tests were carried out by the government extension services. Farmers in only four villages have reported adopting the recommended practices. Even in these villages, only 1-2% of the farmers have reported adopting the practices. **This indicates poor awareness about the importance of soil testing and adopting the recommendations. Farming in these villages could be improved through better soil management practices.**

All three sources of energy (human, animal, and machine) are used in land preparation by all of the sample farmers. Almost 100% of the households use tractors in plowing the land, while 54% of the households use human energy and 35% use animal power[5] (Table 11). The peri-urban district of Medak uses less animal and human power. Rangareddy district uses greater human power (62%) while Mahabubnagar uses more of animal power (44%) when compared to other districts. This clearly indicates the declining importance of draft animals in land preparation, more so among the marginal and small farmers when compared to medium and large farmers (Table 11). Only medium and large farmers are able to maintain the draft power. In the case of sowing, dependence on machine power is very limited, as most of the farmers use human and draft power (Table 12). Only in the case of paddy transplanting do a few farmers use machine power. For all other rainfed and irrigated dry crops (cotton, jowar, etc.), direct or inline sowing is used.

[5] Some villages reported 0% use of draft power during our qualitative research.

Table 11. Land Preparation during Kharif (Percentage of Farmers using Manual/ Animal/Machinery)

Village	Marginal			Small			Medium			Large			All		
	Man	Ani	Mach	Man	Ani	Mach	Man	Ani	Mach	Man	Ani	Mach	Man	Ani	Mach
Kallakal	36	12	96	80	100	100	100	50	100	100	0	0	48	27	97
Jeedipally	50	32	100	50	50	100	0	0	100	0	0	0	48	33	100
Lingareddipet	52	15	96	25	0	100	0	0	100	0	0	0	45	12	97
Medak	**46**	**20**	**98**	**54**	**54**	**100**	**40**	**20**	**100**	**100**	**0**	**0**	**47**	**24**	**98**
Gantlavelli	84	21	100	38	25	100	75	25	100	0	0	100	67	21	100
Mogalagidda	55	45	95	67	33	100	80	80	100	100	100	100	64	52	97
Bhemaram	61	56	100	88	63	100	50	17	100	50	50	100	65	50	100
Chattanpalle	62	0	100	50	7	93	60	0	100	0	0	100	53	3	97
Rangareddy	**66**	**33**	**99**	**58**	**28**	**97**	**65**	**30**	**100**	**38**	**0**	**100**	**62**	**31**	**99**
Chegunta	50	100	100	100	100	100	32	53	95	56	78	100	45	67	97
Gajulapeta	29	29	100	60	40	95	67	50	83	0	0	0	55	39	94
Mudumal	13	25	100	60	20	100	67	67	100	100	100	100	52	36	100
Kotakadira	50	38	100	28	17	100	80	40	100	100	50	100	45	27	100
Zainallpur	80	100	100	65	40	100	33	50	100	0	0	100	58	48	100
Mahabubnagar	**40**	**47**	**100**	**55**	**33**	**99**	**49**	**53**	**96**	**57**	**64**	**100**	**51**	**44**	**98**
All	53	29	98	56	34	98	53	44	97	52	52	100	54	35	98

Note: Man = Manual; Ani = Animal; Mach = machine.

Table 12. Planting Method (Percentage of Farmers using Manual/Animal)

Village	In Line					Transplanting				
	Season	Crop	Area	Irrigation	% of Farmers	Season	Crop	Area	Irrigation	% of Farmers
Kallakal	Kharif	Jowar	24.3	No	100	Kharif	Paddy	30.1	Yes	100
Jeedipally	Kharif	Paddy	2	No	8	Kharif	Paddy	49.3	Yes	92
Lingareddipet	Kharif	Paddy	1.5	No	4	Kharif	Paddy	85.6	Yes	96
Gantlavelli	Kharif	Maize	53.5	No	100	Kharif	Paddy	0	Yes	0
Mogalagidda	Kharif	Paddy	5.28	Yes	5	Kharif	Paddy	41.1	Yes	95
Bhemaram	Kharif	Jowar	71.7	No	100	Kharif	Paddy	18.8	Yes	100
Chattanpalle	Kharif	Jowar	67.8	No	100	Kharif	Paddy	30	Yes	100
Chegunta	Kharif	Cotton	236.8	No	100	Kharif	Paddy	0	No	0
Gajulapeta	Kharif	Jowar	18.9	No	100	Kharif	Paddy	31.3	Yes	100
Mudumal	Kharif	Paddy	6	Yes	17	Kharif	Paddy	57.3	Yes	83
Kotakadira	Kharif	Paddy	0.45	No	5	Kharif	Paddy	77.6	Yes	95
Zainallpur	Kharif	Paddy	5.1	Yes	20	Kharif	Paddy	24.0	Yes	80

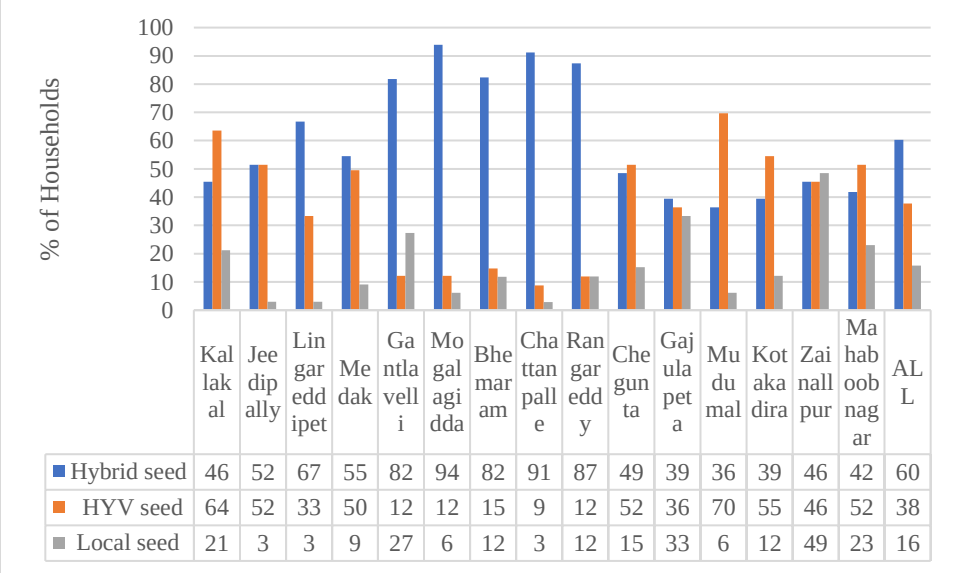
Note: In line and direct sowing are the same. Random method is not in use.

Input Use

Seed

Hybrid, HYV, and local seeds are used by the sample farmers in all the villages. Most of the farmers use hybrid and HYV seeds. At the aggregate level, 98% of the sample farmers use hybrid or HYV seeds, while only 16% of the farmers use local seed (Fig. 5). The highest proportion of Rangareddy district farmers (87%) use hybrid seeds, followed by Medak (55%) and

Mahabubnagar (42%). In fact, the majority of Mahabubnagar farmers use HYV seeds (52%). Use of local seed is also greater in Mahabubnagar. There are wide variations in the adoption of hybrid and HYV seeds across the sample villages. Use of local seeds ranges between 3% in Medak district (Jeedipally and Lingareddipet) and 49% in Mahabubnagar district (Jainallipur). Local seed is used mostly in the case of jowar, followed by red gram, maize, and paddy; no local seed is used in the case of cotton (Table A11). There is not much variation in the quantity of seed used across the villages, ranging from 27 to 31 kg/acre for paddy and 1.25 to 1.5 kg/acre for cotton (Table 13). The seed quantity could be on the higher side due to a lack of awareness. The cost of seed also does not vary much, indicating that sample farmers do not face any price discrimination across the villages. However, farmers pay a relatively higher price for hybrid seeds, followed by HYV and local seeds. Farmers purchase the seeds from the local dealers.



	Kalakal	Jeedipally	Lingareddipet	Medak	Gantlavelli	Mogalagidda	Bhemaram	Chattanpalle	Rangareddy	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainallpur	Mahaboobnagar	ALL
Hybrid seed	46	52	67	55	82	94	82	91	87	49	39	36	39	46	42	60
HYV seed	64	52	33	50	12	12	15	9	12	52	36	70	55	46	52	38
Local seed	21	3	3	9	27	6	12	3	12	15	33	6	12	49	23	16

Figure 5. Percentage of Households using Hybrid, HYV, and Local Seeds

Table 13. Use of HYV, Hybrid, and Local Seed per Acre

Village	HYV				Hybrid				Local			
	Season	Crop	Quantity (kg)	Cost (Rs.)	Season	Crop	Quantity (kg)	Cost (Rs.)	Season	Crop	Quantity (kg)	Cost (Rs.)
Kallakal	Kharif	Paddy	28	850	Kharif	Paddy	30	1050	Kharif	Paddy	25	700
Jeedipally	Kharif	Paddy	30	900	Kharif	Paddy	25	800	Kharif	Paddy	25	700
Lingareddipet	Kharif	Paddy	31	1000	Kharif	Paddy	30	1070	0	0	0	0
Medak			30	920			28	930	0	0	25	700
Gantlavelli	Kharif	Paddy	30	900	Kharif	Paddy	28	950	Kharif	Paddy	26	700
Mogalagidda	Kharif	Paddy	30	900	Kharif	Paddy	30	1080	0	0	0	0
Bhemaram	Kharif	Paddy	30	875	Kharif	Paddy	27	900	0	0	0	0
Chattanpalle	Kharif	Paddy	26	800	Kharif	Paddy	29	1030	Kharif	Paddy	30	800
Rangareddy			24	880			28	975	0	0	28	750
Chegunta	Kharif	Cotton	1.50	2400	Kharif	Cotton	1.25	2450	0	0	0	0
Gajulapeta	Kharif	Paddy	31	1005	Kharif	Paddy	28	950	0	0	0	0
Mudumal	Kharif	Paddy	26	860	Kharif	Paddy	27	875	0	0	0	0
Kotakadira	Kharif	Paddy	27	850	Kharif	Paddy	27	890	Kharif	Paddy	25	700
Zainallpur	Kharif	Paddy	28	850	Kharif	Paddy	26	800	Kharif	Paddy	30	800
Mahabubnagar			--	--			--	--			28	750

Water

As discussed previously, access to irrigation water ranges between 30% and 70% of the area across the three sample districts and varies widely among the sample villages (2%[6] to 80%) (Table 9). Cropwise details of irrigation are presented in Table 14. While 90% of paddy area is under irrigation, other crops are only partially irrigated, as the other crops are low water-intensive crops. Only maize is irrigated 100% in three sample villages and maize needs three to four irrigations. Though the area under maize is less, 52% of it is irrigated at the aggregated level. In the case of red gram, jowar, and cotton, 15-21% of their area is irrigated. Flood irrigation method is the most popular, as very few villages have micro irrigation systems. Though none of the sample households reported using micro irrigation, the drip method of irrigation is used in all the sample villages of Rangareddy, though on a limited scale. The drip method is used for fruit crops, such as mango, lemon, etc., for which drip systems are provided with the subsidy from the horticulture development program of the central government.

[6] This is based on qualitative research, as none of the sample households reported area under irrigation.

Table 14. Proportion of Irrigated Area by Crops in the Sample Villages

Village	Paddy	Cotton	Red Gram	Jowar	Maize
Kallakal	95.0	0	47.8	27.5	100.0
Jeedipally	98.7	0	0.0	73.2	100.0
Lingareddipet	63.4	0.0	44.4	39.0	0
Medak	83.3	0.0	39.3	40.0	100.0
Gantlavelli	98.5	0	0	5.9	32.4
Mogalagidda	100.0	57.5	0.0	31.5	0
Bhemaram	87.0	0.0	90.9	5.6	0
Chattanpalle	100.0	0.0	20.0	19.9	0
Rangareddy	97.6	24.2	31.5	14.0	32.4
Chegunta	0.0	3.9	0.0	0.0	0
Gajulapeta	93.8	0.0	15.5	14.6	0
Mudumal	82.2	50.2	21.4	0	0
Kotakadira	98.5	0	63.2	0.0	0
Zainallpur	100.0	0.0	46.7	29.4	100.0
Mahabubnagar	90.9	13.9	18.4	22.2	100.0
Total	90.5	15.4	20.9	20.6	52.4

Fertilizers

Farmers purchase fertilizers from the dealers and merchants (Fig. 6). The majority of the farmers pay in cash, and thus, there is no credit obligations for most farmers. Credit obligations can often lead to a compromise in quality. Farmers use mainly five types of inorganic fertilizers – urea, diammonium phosphate (DAP), single superphosphate (SSP), triple superphosphate (TSP), and muriate of potash (MOP). **At the aggregate level, farmers use more than 0.94 mt/ha of chemical fertilizers, which is double that of the recommended dose.** Among the districts, the average usage ranges between 1.35 mt/ha in Medak and to 0.8 mt/ha in Mahabubnagar (Table 15). Fertilizer use is higher in the irrigated villages, where paddy is grown. Though it is expected that commercial crops such as cotton are more fertilizer intensive, cotton is grown mostly under rainfed conditions (kharif) in the sample villages. **Fertilizer consumption across size classes does not much.** In most cases, however, medium and large farmers tend to use more fertilizer per acre when compared to marginal and small farmers (Table 16). Due to the use of irrigation mainly for paddy, the consumption of fertilizer is higher on paddy compared to other crops (Tables A12 to A16). As far as organic matter is concerned, farmers in the sample villages use only FYM. They use about 4.4 mt/ha of FYM at the aggregate level (Table 16) against the recommended quantity of 11-22.5 mt/ha (MANAGE, 2017). Medak district villages use highest quantity (4.95 mt/ha) of FYM, followed by Mahabubnagar (4.45 mt/ha) and Rangareddy (3.75 mt/ha) (Table 17). This is despite the fact that Rangareddy has a higher density of livestock compared to Medak. FYM is used mainly on kharif crops of paddy, maize, and cotton. **Sample farmers are not using any other organic manure, such as vermicomposting, green manure, or biochar.[7] There is a clear**

[7] Green manure is ploughing of the standing crops, usually done in the case of leguminous crops. Biochar is burning stubble in the field.

need for increasing the application of organic matter (at least doubling). Promoting vermicomposting, green manure, etc., should be explored.

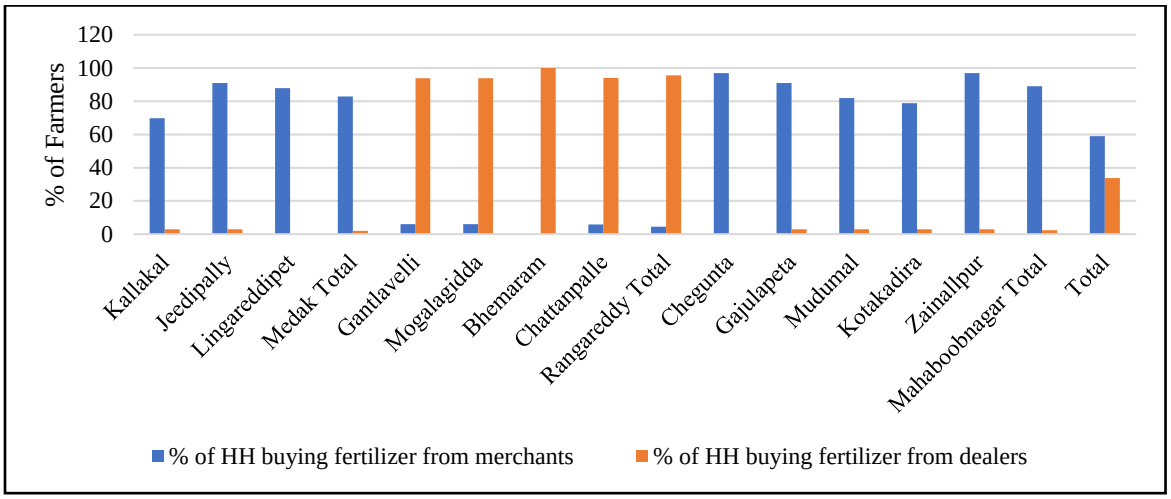


Figure 6. Source of Fertilizers (Percentage of Farmers Buying)

Table 15. Use of Chemical Fertilizers in the Sample Villages (in mt/ha for All Crops and All Seasons)

Villages	Urea		DAP		SSP		TSP		MOP	
	Quantity	Cost (Rs.)	Quantity	Cost (Rs.)	Quantity	Cost (Rs.)	Quantity	Cost (Rs.)	Quantity	Cost (Rs.)
Kallakal	0.43	1,255	0.24	2,635	0.07	667	0.29	1,989	0.12	819
Jeedipally	0.81	2,349	0.21	2,041	0.17	750	0.26	1,738	0.18	1,359
Lingareddipet	0.41	1,167	0.38	4,075	0.00	0	0.19	1,383	0.09	783
Medak	0.53	**1,548**	0.28	**2,971**	0.14	**722**	0.25	**1,740**	0.15	**1,066**
Gantlavelli	0.24	608	0.20	1,776	0.00	0	0.12	925	0.13	1,250
Mogalagidda	0.42	1,011	0.21	1,919	0.00	0	0.14	945	0.14	1,172
Bhemaram	0.21	532	0.18	1,746	0.16	619	0.12	759	0.11	1,041
Chattanpalle	0.23	663	0.15	1,551	0.00	0	0.11	800	0.10	753
Rangareddy	0.28	**720**	0.19	**1,762**	0.16	**619**	0.13	**885**	0.12	**1,095**
Chegunta	0.19	529	0.18	1,918	0.07	393	0.12	785	0.09	468
Gajulapeta	0.23	880	0.19	1,815	0.12	650	0.10	769	0.12	887
Mudumal	0.26	733	0.21	2,024	0.08	272	0.14	658	0.13	800
Kotakadira	0.32	766	0.22	1,964	0.08	306	0.13	766	0.12	1,064
Zainallpur	0.31	787	0.21	2,080	0.10	438	0.16	908	0.12	919
Mahabubnagar	0.26	**744**	0.20	**1,963**	0.09	**404**	0.13	**770**	0.12	**850**
All	0.33	918	0.21	2,111	0.11	490	0.16	1,020	0.13	984

Table 16. Total Fertilizer Use per Acer across Size Classes (in mt/ha)

Villages	Marginal	Small	Medium	Large	All
Kallakal	0.51	0.56	0.52	0.54	0.52
Jeedipally	0.59	0.53	0.56	0.00	0.58
Lingareddipet	0.50	0.62	0.53	0.00	0.52
Medak	**0.53**	**0.58**	**0.53**	**0.54**	**0.54**
Gantlavelli	0.45	0.58	0.44	0.41	0.49
Mogalagidda	0.43	0.55	0.56	0.53	0.50
Bhemaram	0.44	0.47	0.40	0.45	0.44
Chattanpalle	0.39	0.45	0.34	0.54	0.42
Rangareddy	**0.43**	**0.52**	**0.43**	**0.49**	**0.46**
Chegunta	0.48	0.52	0.58	0.55	0.56
Gajulapeta	0.42	0.43	0.46	0.00	0.43
Mudumal	0.48	0.49	0.55	0.56	0.51
Kotakadira	0.56	0.63	0.50	0.60	0.59
Zainallpur	0.43	0.53	0.46	0.51	0.50
Mahabubnagar	**0.48**	**0.51**	**0.53**	**0.55**	**0.51**
All	0.49	0.52	0.49	0.51	0.50

Table 17. Use of Organic Fertilizers (in mt/ha)

	Animal (FYM)			
Village	Season	Crop	Quantity (mt/ha)	Cost (Rs.)
Kallakal	Kharif	Paddy	4.34	2,028
Jeedipally	Kharif	Paddy	5.94	2,754
Lingareddipet	Kharif	Paddy	5.04	2,200
Medak	**Kharif**	**Paddy**	5.11	**2,330**
Gantlavelli	Kharif	Paddy	5.96	1,678
Mogalagidda	Kharif	Paddy	3.47	1,345
Bhemaram	Kharif	Paddy	3.51	1,077
Chattanpalle	Kharif	Paddy	3.26	1,031
Rangareddy	**Kharif**	**Paddy**	3.76	**1,220**
Chegunta	Kharif	Paddy	3.06	1,190
Gajulapeta	Kharif	Paddy	5.56	2,061
Mudumal	Kharif	Paddy	3.94	1,297
Kotakadira	Kharif	Paddy	5.90	1,818
Zainallpur	Kharif	Paddy	3.11	1,472
Mahabubnagar	**Kharif**	**Paddy**	4.46	**1,652**
All	Kharif	Paddy	4.41	1,709

Pesticides

Pests and diseases are the second important factor, after natural factors like rainfall, droughts, floods, etc., that influence crop yields and profit margins. Paddy, cotton, and maize crops are affected by pests and diseases in the sample villages. Major pests and diseases are listed in Table 17. While incidence is common in all the villages, the intensity of pests and diseases is

critical in affecting the crop yields. In Rangareddy sample villages, 71% of the farmers reported bad and very bad infestation. In Medak, 45% of the sample farmers reported bad and very bad infestation, followed by 42% in Mahabubnagar district. In three sample villages of Rangareddy district, paddy, cotton, and maize have been very badly affected in the majority of the cases (Table 18). Only Chegunta village in Mahabubnagar has the lowest proportion (26%) of farmers badly affected. At the aggregate level, farmers use 0.7 liters (L) of liquid and 0.56 kg of powder pesticides (Table 19). Though there is not much variation across sample villages, Mahabubnagar has the highest usage, followed by Medak and Rangareddy. Despite the fact that Rangareddy sample villages have a high level of infestation, the use of pesticide is low. The infestation is high due to lower application of pesticides. **Across the size classes, large and medium farmers tend to use more pesticides per acre compared marginal and small farmers.**

Table 18. Incidence of Pests and Diseases in the Sample Villages

Village	Pests			Diseases			Level of Infestation (% of HHs)		
	Season	Crop	Name	Season	Crop	Name	Slight	Bad	Very Bad
Kallakal	Kharif	Paddy (I)	Stem borer, brown plat hopper	Kharif	Paddy	Sheath blight, brown spot	59	38	3
Jeedipally	Kharif	Paddy (I)	Stem borer, brown plat hopper	Kharif	Paddy	Sheath blight, brown spot	47	53	0
Lingareddipet	Kharif	Paddy (I)	Stem borer, brown plat hopper	Kharif	Paddy	Sheath blight, brown spot	59	39	2
Medak							**55**	**43**	**2**
Gantlavelli	Kharif	Maize	Fall armyworm	Kharif	Maize	Leaf spot	32	60	8
Mogalagidda	Kharif	Paddy (I)	Stem borer, brown plat hopper	Kharif	Paddy	Sheath blight, blast	44	0	56
Bhemaram	Kharif	Cotton	Sucking pest, pink boll worm	Kharif	Cotton	Fusarium wilt, Cercospora leaf spot	19	43	38
Chattanpalle	Kharif	Paddy (I)	Stem borer, brown plat hopper	Kharif	Paddy		25	30	45
Rangareddy							**30**	**36**	**35**
Chegunta	Kharif	Cotton	Pink boll worm, borers, sucking pest	Kharif	Cotton	Fusarium wilt, Verticillium wilt, Cercospora wilt	74	26	0
Gajulapeta	Kharif	Paddy (I)	Stem borer, hispa, BPH	Kharif	Paddy	Sheath blight, Brow spot	55	35	10
Mudumal	Kharif	Paddy (I)	Stem borer, hispa, BPH	Kharif	Paddy	Sheath blight, brown spot	59	41	0

Village	Pests			Diseases			Level of Infestation (% of HHs)		
	Season	Crop	Name	Season	Crop	Name	Slight	Bad	Very Bad
Kotakadira	Kharif	Paddy (I)	Stem borer, hispa, BPH	Kharif	Paddy	Sheath blight, brown spot	48	44	7
Zainallpur	Kharif	Jowar	Stem borer, Shoot fly	Kharif	Jowar	Wilt	52	44	4
Mahabubnagar							59	38	4
Total							51	39	11

Note: Irrigation status in parentheses: (I).

Table 19. Use of Pesticides in the Sample Villages (Quantity/Acre)

Village	Marginal Farmers		Small Farmers		Medium Farmers		Large Farmers		All	
	Pesticides (L)	Pesticides (kg)	Pesticides (L)	Pesticides (kg)	Pesticides (L)	Pesticides (kg)	Pesticides (L)	Pesticides (kg)	Pesticides (L)	Pesticides (kg)
Kallakal	0.68	0.42	0.63	0.18	0.75		0.77	0.92	0.68	0.46
Jeedipally	0.76	0.50	0.33	0.75	0.50	0.63	0	0	0.71	0.58
Lingareddipet	0.85	0.38	0.50	0.18	0.88		0	0	0.79	0.32
Medak	**0.78**	**0.44**	**0.55**	**0.37**	**0.75**	**0.63**	**0.77**	**0.92**	**0.74**	**0.47**
Gantlavelli	0.53	0	0.19	0.44	0.60	0	1.03	0	0.57	0.44
Mogalagidda	0.63	0.72	0.65	0.65	1.08	0	0.17	0.77	0.69	0.70
Bhemaram	0.59	0.45	0.28	0	0.47	0.75	1.14	0	0.49	0.60
Chattanpalle	0.67	0.55	0.45	0.33	0.23	0	0.48	0.91	0.47	0.59
Rangareddy	**0.60**	**0.60**	**0.40**	**0.52**	**0.56**	**0.75**	**0.66**	**0.84**	**0.53**	**0.62**
Chegunta	0.73	0.50	0.89	0.22	0.70	0.70	0.75	0.80	0.72	0.67
Gajulapeta	0.75	0	0.78	0.40	0.44				0.68	0.40
Mudumal	0.76	0	0.99	0.70	0.41	0.54	0.75	0.50	0.78	0.63
Kotakadira	0.85	0	0.89	0.66	0.31		0.56	0.27	0.84	0.58
Zainallpur	1.00	0	0.77		0.60	0.50	0.60	0.40	0.76	0.47
Mahabubnagar	**0.81**	**0.50**	**0.86**	**0.54**	**0.58**	**0.63**	**0.72**	**0.62**	**0.76**	**0.58**
All	0.75	0.49	0.72	0.51	0.59	0.64	0.70	0.70	0.70	0.56

Note: Pesticides included with units per liter include Monocrotophos, Corazen, Chlorpyriphos, Confidor, etc. Pesticides with units in kilograms include Acephate, Tricyclazole, Granules, etc.

Labor

Labor has become one of the most scarce inputs for agriculture in recent years, especially after the introduction of the employment guarantee program (MGNERG). Labor became not only scarce but also expensive. This is more so in the peri-urban locations, where alternative employment avenues are available along with better wages. Availability of labor has become a constraint in the case of harvesting commercial crops, such as cotton. In our sample villages, labor use per acre is about 35 days in most of the villages (Table 20). Only in villages such as Chegunta, where cotton is the main crop, is labor usage more than 40 days. **The contribution of women accounts for two-thirds of the labor use. This is uniform across the sample villages and size classes. This supports the argument for "feminization of agriculture." In the case of labor use across farm**

size classes, medium and large farmers seem to be using more labor per acre. It is widely believed that marginal and small farmers use more labor than medium and large farmers due to the availability of family labor. Though marginal and small farmers use more family labor, the share of family labor in total labor use is only about 40% (Table 21). This indicates that the dependence of marginal and small farmers on hired labor is higher. As a result, the increasing costs of labor forces marginal and small farmers to reduce their labor inputs (Reddy, et. al., 2005). Medium and large farmers have ability to employ more labor. In the case of marginal and small farmers, the higher wages in the non-farm sector coupled with their natural preference for urban employment, family labor is decreasing in farm activities. A detailed account of operation-wise labor use is provided in Table A17.

Table 20. Total Labor Use per Acre (Days) across Size Classes in the Sample Villages

	Marginal		Small		Medium		Large		All	
Village	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Kallakal	10.3	21.1	14.0	26.3	12.9	18.3	13.0	23.0	11.2	21.8
Jeedipally	12.9	19.4	14.1	22.7	16.8	23.5	0	0	13.2	20.0
Lingareddipet	11.0	24.3	16.5	27.5	10.5	25.8	0	0	11.9	25.1
Medak	**11.4**	**21.6**	**15.0**	**26.0**	**12.2**	**23.2**	**13.0**	**23.0**	**12.0**	**22.4**
Gantlavelli	11.8	22.7	15.5	25.7	18.2	32.4	15.3	24.2	14.0	25.0
Mogalagidda	11.7	23.2	13.3	26.2	10.7	23.1	12.1	20.7	12.1	23.9
Bhemaram	11.9	25.4	10.9	22.5	11.7	20.4	12.1	21.1	11.6	22.9
Chattanpalle	10.1	22.6	11.6	18.3	16.4	28.2	13.5	29.9	12.5	22.8
Rangareddy	**11.6**	**23.5**	**12.8**	**22.9**	**13.9**	**25.1**	**13.1**	**23.9**	**12.5**	**23.7**
Chegunta	12.5	32.1	9.6	19.6	14.0	28.2	13.2	31.1	13.4	28.8
Gajulapeta	11.8	20.9	12.4	25.1	11.2	18.8	0	0	12.1	23.5
Mudumal	11.8	18.8	11.1	19.7	10.6	21.0	17.1	22.6	11.2	20.0
Kotakadira	13.5	22.9	11.7	21.3	11.3	19.3	14.7	25.6	12.3	21.7
Zainallpur	9.6	24.4	15.2	19.6	8.6	21.3	13.4	22.6	13.1	20.8
Mahabubnagar	**11.9**	**22.3**	**12.9**	**21.7**	**11.7**	**23.4**	**13.5**	**28.4**	**12.5**	**22.9**
All	11.5	22.5	13.1	22.6	12.6	24.1	13.3	26.0	12.4	23.1

Note: Labor includes land preparation, seeding, fertilizer application, weeding, irrigation, harvesting, and post-harvest activities.

Table 21. Family Labor Use per Acre (Days) across Size Classes in the Sample Villages

Village	Marginal		Small		Medium		Large		All	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Kallakal	7.1	7.8	8.8	4.4	6.7	7.5	1.7	1.5	7.2	7.1
Jeedipally	6.7	8.5	6.8	5.4	4.7	5.5	0	0	6.6	8.0
Lingareddipet	6.1	7.7	10.5	8.6	4.7	4.8	0	0	6.7	7.5
Medak	**6.6**	**8.0**	**9.0**	**6.3**	**5.3**	**5.7**	**1.7**	**1.5**	**6.9**	**7.5**
Gantlavelli	5.1	7.3	9.7	9.8	3.7	7.1	1.1	0.4	6.0	7.5
Mogalagidda	7.9	7.3	6.8	6.2	5.6	9.8	5.8	3.9	7.1	7.0
Bhemaram	6.2	9.1	7.3	8.5	5.3	6.0	3.8	2.0	6.0	7.3
Chattanpalle	6.2	4.4	6.0	3.0	4.9	3.5	3.0	4.9	5.5	3.7
Rangareddy	**6.4**	**7.3**	**7.3**	**6.5**	**5.0**	**6.2**	**3.5**	**2.8**	**6.2**	**6.4**
Chegunta	7.3	7.8	6.8	5.1	4.5	6.0	2.0	0.5	4.0	4.2
Gajulapeta	6.0	7.6	7.3	6.9	3.4	2.9	0	0	6.5	6.4
Mudumal	7.1	5.5	6.3	5.2	3.6	3.3	3.5	1.5	5.4	4.5
Kotakadira	5.8	5.3	6.2	4.5	3.2	1.9	1.9	0.7	5.4	4.1
Zainallpur	6.9	7.0	8.5	8.2	4.6	4.3	2.0	2.6	7.0	6.9
Mahabubnagar	**6.5**	**6.3**	**7.3**	**6.6**	**4.1**	**4.3**	**2.1**	**1.0**	**5.8**	**5.4**
All	6.5	7.5	7.5	6.5	4.5	5.2	2.8	1.9	6.2	6.3

Credit

Credit is an important factor that influences crop yields. Timely use of inputs depends on the availability of cash/credit with the farmers. While a number of earlier studies have shown that farmers dependence on credit is quite high in Telangana (LNRMI, 2010), our sample villages indicate a less severe situation. Overall, only 33% of the sample farmers have debt (Table 22). Of the three sample districts, Mahabubnagar has the highest proportion (56%) of farmers with debt, while Medak and Rangareddy districts have 16% and 17%, respectively. The average household debt ranges between Rs. 28,333 in Kallakal (Medak) and Rs. 135,040 in Chegunta (Mahabubnagar). The higher household debt could be due to the fact that in Chegunta more than 80% of the area is under cotton, which is highly input intensive (including labor). While large farmers reported debt only in Mahabubnagar, a greater proportion of medium-size farmers have debt. The amount of debt is also higher among medium-size farmers. Banks are the main source of loans, as farmers take loans from money lenders in only two villages of Medak (Table 23). Money lenders charge highest rate of interest, while banks charge around 10% in most cases. Almost all of the sample farmers take loans for 12 months, i.e., agriculture loans. In all cases, outstanding loans are less than the actual debt, since farmers repay the loans on a regular basis. The debt-to-income ratio indicates the actual debt burden, which is the highest in Rangareddy district (52%), followed by Mahabubnagar district (43%) and Medak (21%). This is reasonable given that the debts are taken at a low interest rate from the institutional sources. The low debt burden is mainly due to the welfare measures provided by the state government in recent years. Most important among them is the cash transfer of Rs. 10,000 per acre per year toward input costs to the farmers (started in 2018-19). Money is transferred directly to the farmers' bank accounts

before the start of kharif season (Rs. 5,000) and before rabi season (Rs. 5,000). Other programs include old-age pensions (Rs. 2,000 per month to all people above 60 years of age) and cash support toward the marriage of a female child. These programs have reduced the cash dependence of farmers.

Table 22. Average Debt (Rs./HH)

Village	Marginal	Small	Medium	Large	All
Kallakal	28,750 (8)	25,000 (1)	0	0	28,333 (9)
Jeedipally	65,000 (2)	0	100,000 (1)	0	76,667 (3)
Lingareddipet	20,000 (1)	80,000 (3)	0	0	65,000 (4)
Medak	**34,545 (11) [14%]**	**66,250 (4) [11%]**	**100,000 (1) [16%]**	**0 (0)**	**46,563 (16) [16%]**
Gantlavelli	25,833 (6)	65,000 (2)	65,000 (1)	0	38,889 (9)
Mogalagidda	0	90,000 (2)	200,000 (1)	0	126,667 (3)
Bhemaram	59,667 (3)	80,000 (3)	206,667 (3)	0	115,444 (9)
Chattanpalle	0	100,000 (1)	200,000 (1)	0	150,000 (2)
Rangareddy	**37,111 (9) [13%]**	**81,250 (8) [22%]**	**180,833 (6) [30%]**	**0 (0)**	**89,957 (23) [17%]**
Chegunta	75,000 (2)	100,000 (1)	125,375 (16)	186,667 (6)	135,040 (25)
Gajulapeta	80,000 (1)	59,545 (11)	72,500 (4)	0	64,063 (16)
Mudumal	30,000 (4)	56,500 (8)	100,833 (6)	0	65,389 (18)
Kotakadira	25,000 (7)	89,750 (8)	45,000 (2)	200,000 (2)	72,789 (19)
Zainallpur	25,000 (3)	86,857 (7)	90,000 (3)	50,000 (1)	71,643 (14)
Mahabubnagar	**35,294 (17) [55%]**	**72,371 (35) [45%]**	**105,194 (31) [72%]**	**174,444 (9) [60%]**	**86,565 (92) [56%]**

In () number of household taken loan and [%] are respective percentage of total sample farmers.

Table 23. Credit Details of Sample Households (Average per HH)

Village	Source of Credit	Loan Amount (Rs.)	Period (months)	Rate of Interest	Outstanding	Debt/ Income Ratio
Kallakal	Bank	28,333	12	10	19,222	11
Jeedipally	Money lenders	76,667	12	36	50,000	30
Lingareddipet	Money lenders	65,000	12	17	53,750	38
Medak	**Bank**	**46,563**	**12**	**17**	**33,625**	**21**
Gantlavelli	Bank	38,889	13	11	40,778	25
Mogalagidda	Bank	126,667	14	8	116,667	64
Bhemaram	Bank	115,444	11	3	115,889	76
Chattanpalle	Bank	150,000	12	13	145,000	75
Rangareddy	**Bank**	**89,957**	**12**	**4**	**89,130**	**52**
Chegunta	Bank	135,040	12	10	109,640	36
Gajulapeta	Bank	64,063	11	10	61,313	45
Mudumal	Bank	65,389	10	14	64,722	52
Kotakadira	Bank	72,789	11	12	62,579	46
Zainallpur	Bank	71,643	12	11	64,500	34
Mahabubnagar	**Bank**	**86,565**	**11**	**11**	**75,859**	**43**
All	Bank	82,275	11	11	73,031	43

Produce Marketing

Marketing of produce in terms of distance, price information, sources, and time of sale can make or break the fortunes of farmers. Sample villages vary widely in terms of distance from the markets, ranging between 3 and 34 kilometers (km) (Fig. 7). These variations are observed even within the sample districts. Within Mahabubnagar district, the distances vary between 6 and 34 km, while in other districts the maximum distance is 18 km. Farmers in the Mahabubnagar sample villages could be at a disadvantage. Despite the differences in distance, neighboring farmers are the main source of market information, with more than 80% of the farmers depending on neighbors for market information (Fig. 8). Retailer is the second main source of information. In Rangareddy sample villages, 58% of the sample farmers also rely on retailers; in Medak 27% of the farmers depend on wholesalers. Community groups also provide information to 38% of the households in Rangareddy. **It appears that villages in Rangareddy district rely on multiple sources of market information compared to other districts. There are no FPOs in the sample villages. Though there are agriculture markets and in two of the sample villages farmers reported taking their produce to these markets (as revealed in our qualitative research), none of our sample farmers have used them.**

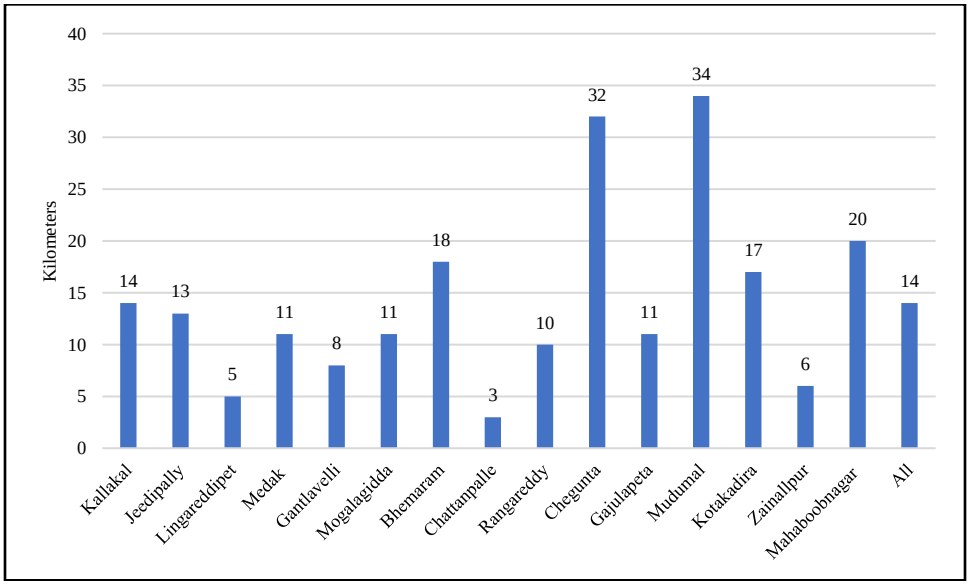
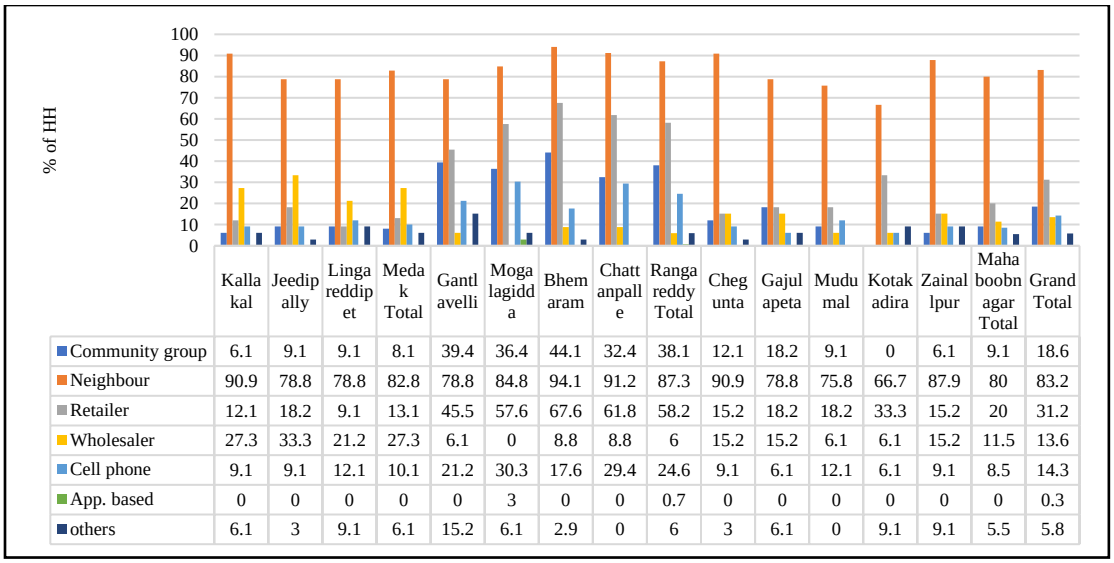


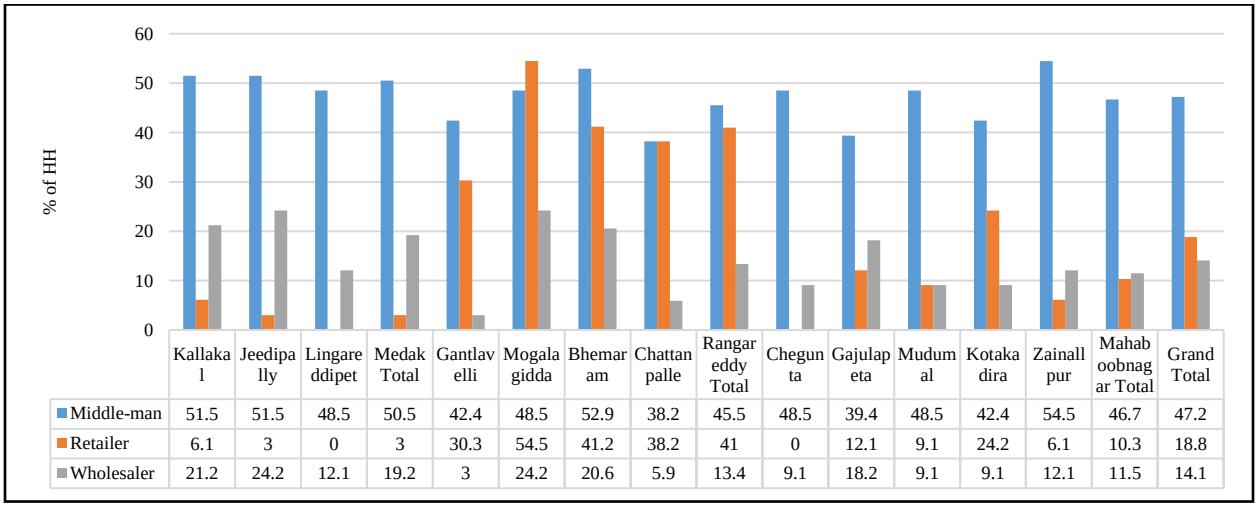
Figure 7. Distance from the Market



	Kallakal	Jeedipally	Lingareddipet	Medak Total	Gantlavelli	Mogalagidda	Bhemaram	Chattanpalle	Rangareddy Total	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainalpur	Mahaboobnagar Total	Grand Total
Community group	6.1	9.1	9.1	8.1	39.4	36.4	44.1	32.4	38.1	12.1	18.2	9.1	0	6.1	9.1	18.6
Neighbour	90.9	78.8	78.8	82.8	78.8	84.8	94.1	91.2	87.3	90.9	78.8	75.8	66.7	87.9	80	83.2
Retailer	12.1	18.2	9.1	13.1	45.5	57.6	67.6	61.8	58.2	15.2	18.2	18.2	33.3	15.2	20	31.2
Wholesaler	27.3	33.3	21.2	27.3	6.1	0	8.8	8.8	6	15.2	15.2	6.1	6.1	15.2	11.5	13.6
Cell phone	9.1	9.1	12.1	10.1	21.2	30.3	17.6	29.4	24.6	9.1	6.1	12.1	6.1	9.1	8.5	14.3
App. based	0	0	0	0	0	3	0	0	0.7	0	0	0	0	0	0	0.3
others	6.1	3	9.1	6.1	15.2	6.1	2.9	0	6	3	6.1	0	9.1	9.1	5.5	5.8

Figure 8. Source of Market Information (% HH)

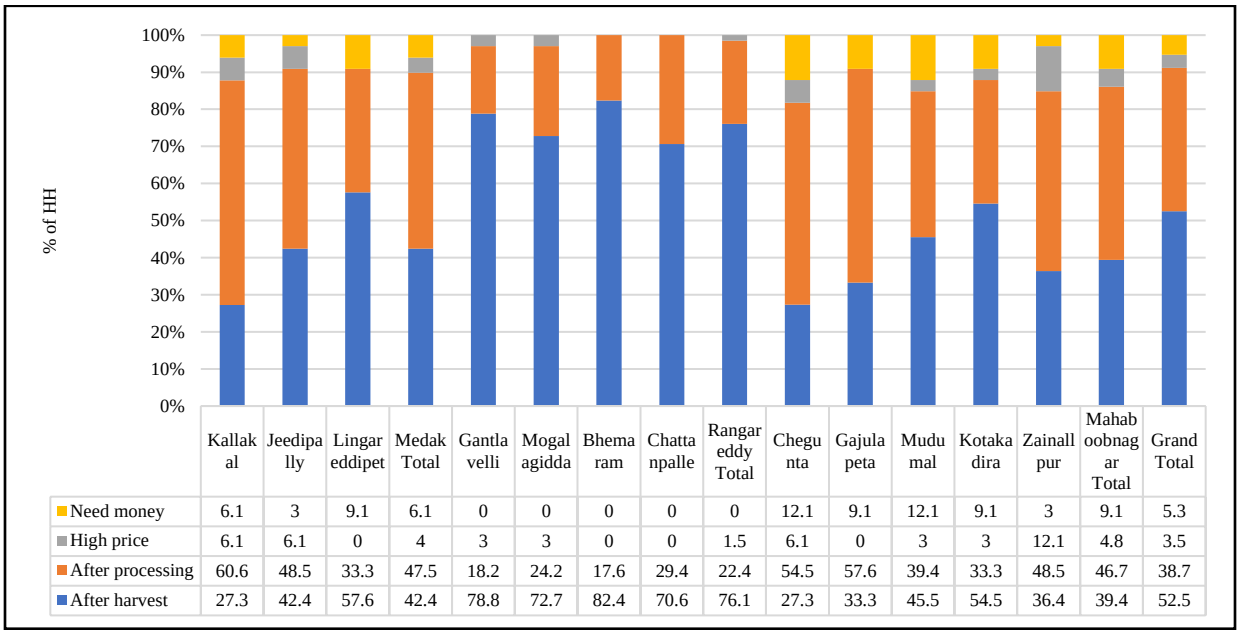
Irrespective of the source of information and the distance from the market, the majority of the farmers sell their produce to middlemen. Interestingly, the preference for middlemen seems to be high even in the villages close to the markets (Fig. 9). This may be due to the convenience of selling within the village. Only in Rangareddy did more than 40% of the sample farmers also sell their produce to retailers in the nearby town. Most of the farmers sell their produce immediately after harvesting (cotton) or after preliminary processing (paddy, red gram, jowar, and maize). Both of these cases may be considered sales immediately after harvesting (Fig. 10). Less than 5% of the farmers wait for higher price; these are large- and medium-size farmers.



	Kallakal	Jeedipally	Lingareddipet	Medak Total	Gantlavelli	Mogalagidda	Bhemaram	Chattanpalle	Rangareddy Total	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainallpur	Mahaboobnagar Total	Grand Total
Middle-man	51.5	51.5	48.5	50.5	42.4	48.5	52.9	38.2	45.5	48.5	39.4	48.5	42.4	54.5	46.7	47.2
Retailer	6.1	3	0	3	30.3	54.5	41.2	38.2	41	0	12.1	9.1	24.2	6.1	10.3	18.8
Wholesaler	21.2	24.2	12.1	19.2	3	24.2	20.6	5.9	13.4	9.1	18.2	9.1	9.1	12.1	11.5	14.1

Note: Figures do not add up to 100%, since some farmers do not sell their produce.

Figure 9. Output Sales to Different Market Sources (% HH)



	Kallakal	Jeedipally	Lingareddipet	Medak Total	Gantlavelli	Mogalagidda	Bhemaram	Chattanpalle	Rangareddy Total	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainallpur	Mahaboobnagar Total	Grand Total
Need money	6.1	3	9.1	6.1	0	0	0	0	0	12.1	9.1	12.1	9.1	3	9.1	5.3
High price	6.1	6.1	0	4	3	3	0	0	1.5	6.1	0	3	3	12.1	4.8	3.5
After processing	60.6	48.5	33.3	47.5	18.2	24.2	17.6	29.4	22.4	54.5	57.6	39.4	33.3	48.5	46.7	38.7
After harvest	27.3	42.4	57.6	42.4	78.8	72.7	82.4	70.6	76.1	27.3	33.3	45.5	54.5	36.4	39.4	52.5

Figure 10. Time of Sale

Crop Production Costs and Returns

Farmers' ultimate objective is to maximize profits. As a first step in that direction, farmers aim to increase the yields in a given biophysical context. All of the agricultural practices discussed in the preceding sections help achieve that objective. But given the variations in practices, crop productivities vary between farmers, villages, and districts. These variations may not translate into net incomes, as the returns on input use may vary depending on the efficiency of their use. In the event of inefficient allocation of inputs, higher yields may not translate into higher net returns, i.e., increase in crop yields may come at higher cost. Prices do not differ much within the village, given that majority of the farmers sell to a single source; however, prices do vary across the villages.

Costs vary across the villages and districts for all the crops. Cotton has the highest cost per acre (Table 25) followed by paddy (Table 24), red gram (Table 26), jowar (Table 27), and maize (Table 28). In terms of relative costs, human labor accounts for more than 50% of the total costs for all the crops. Only in Mahabubnagar was the share of labor less than 50% for cotton, jowar, and maize crops, though it was the single largest component. The share of labor is higher for paddy compared to cotton and other crops. Labor costs range between 41% and 66% across the sample villages and crops. Animal and machine labor is the second largest cost component, followed by fertilizers, seeds, and pesticides. Across the size classes, marginal and small farmers use higher amounts of labor when compared to medium and large farmers universally (Table 29). Medium and large farmers tend to spend more for fertilizers and pesticides, though in some cases small farmers spend equally. This pattern is more or less same for all the crops. Labor has become single largest component of total cost. Labor requirements be considered when introducing GAPs. Labor

constraint is one of the main reasons for the failure of system of rice intensification (SRI) paddy in the region (Reddy and Reddy, 2007).

Table 24. Cost of Production and Relative Share (%) of Costs (Rs. per Acre) of Paddy

Village	Land Preparation*	Seeds	Labor	FYM	Fertilizer	Pesticide	Total Cost
Kallakal	2,699 (13.7)	1,250 (6.4)	11,703 (59.6)	382 (1.9)	2,950 (15.0)	657 (3.3)	19,642
Jeedipally	2,556 (13.3)	1,295 (6.8)	12,628 (65.9)	226 (1.2)	1,396 (7.3)	1,061 (5.5)	19,162
Lingareddipet	2,650 (11.3)	1,253 (5.4)	14,721 (62.9)	614 (2.6)	3,172 (13.5)	1,006 (4.3)	23,417
Medak	**2,631 (12.6)**	**1,267 (6.1)**	**13,160 (63.0)**	**416 (2.0)**	**2,499 (12.0)**	**928 (4.4)**	**20,900**
Gantlavelli	2,599 (14.5)	1,354 (7.6)	11,205 (62.5)	347 (1.9)	2,361 (13.2)	59 (0.3)	17,926
Mogalagidda	2,985 (13.8)	1,317 (6.1)	13,798 (63.7)	609 (2.8)	2,333 (10.8)	624 (2.9)	21,667
Bhemaram	2,017 (12.8)	1,024 (6.5)	10,155 (64.2)	324 (2.1)	1,927 (12.2)	369 (2.3)	15,817
Chattanpalle	3,088 (18.5)	1,412 (8.4)	9,071 (54.3)	804 (4.8)	1,898 (11.4)	438 (2.6)	16,711
Rangareddy	**2,702 (14.6)**	**1,290 (7.0)**	**11,400 (61.8)**	**514 (2.8)**	**2,178 (11.8)**	**370 (2.0)**	**18,454**
Chegunta	3,452 (18.6)	1,786 (9.6)	10,298 (55.5)	0 (0.0)	1,833 (9.9)	1,190 (6.4)	18,560
Gajulapeta	2,932 (20.0)	930 (6.3)	7,069 (48.2)	331 (2.3)	2,434 (16.6)	955 (6.5)	14,651
Mudumal	3,952 (19.8)	1,686 (8.4)	8,895 (44.5)	385 (1.9)	3,550 (17.8)	1,529 (7.6)	19,997
Kotakadira	2,461 (16.6)	1,105 (7.4)	8,295 (55.8)	357 (2.4)	2,032 (13.7)	616 (4.1)	14,866
Zainallpur	2,505 (15.6)	1,299 (8.1)	8,152 (50.8)	701 (4.4)	2,896 (18.1)	480 (3.0)	16,033
Mahabubnagar	**2,942 (18.1)**	**1,243 (7.6)**	**8,159 (50.1)**	**409 (2.5)**	**2,621 (16.1)**	**895 (5.5)**	**16,269**
All	**2,756 (14.9)**	**1,267 (6.8)**	**10,936 (59.0)**	**448 (2.4)**	**2,424 (13.1)**	**718 (3.9)**	**18,550**

Note: Land preparation includes animal and machine labor.
Figures in parentheses are the relative share in %.

Table 25. Cost of Production and Relative Share (%) of Costs (Rs. per Acre) of Cotton

Village	Land Preparation*	Seeds	Labor	FYM	Fertilizer	Pesticide	Total Cost
Lingareddipet	4,762 (19.2)	1,714 (6.9)	13,512 (54.5)	286 (1.2)	2,143 (8.6)	2,381 (9.6)	24,798
Medak	**4,762 (19.2)**	**1,714 (6.9)**	**13,512 (54.5)**	**286 (1.2)**	**2,143 (8.6)**	**2,381 (9.6)**	**24,798**
Mogalagidda	3,969 (13.9)	1,635 (5.7)	18,146 (63.3)	406 (1.4)	3,938 (13.7)	560 (2.0)	28,653
Bhemaram	4,376 (14.2)	3,071 (9.9)	17,649 (57.2)	512 (1.7)	4,164 (13.5)	1,100 (3.6)	30,872
Chattanpalle	6,125 (19.8)	1,492 (4.8)	18,688 (60.3)	1,333 (4.3)	2,543 (8.2)	808 (2.6)	30,988
Rangareddy	**4,369 (14.5)**	**2,401 (8.0)**	**17,922 (59.6)**	**540 (1.8)**	**3,944 (13.1)**	**873 (2.9)**	**30,050**
Chegunta	5,804 (21.5)	2,911 (10.8)	11,514 (42.7)	281 (1.0)	3,870 (14.4)	2,568 (9.5)	26,948
Gajulapeta	3,583 (13.5)	1,452 (5.5)	17,065 (64.4)	667 (2.5)	3,176 (12.0)	561 (2.1)	26,503
Mudumal	5,761 (19.1)	2,212 (7.3)	14,193 (47.1)	352 (1.2)	5,096 (16.9)	2,494 (8.3)	30,108
Zainallpur	3,500 (12.5)	2,745 (9.8)	15,864 (56.6)	1,273 (4.5)	3,109 (11.1)	1,527 (5.5)	28,018
Mahabubnagar	**5,509 (19.7)**	**2,511 (9.0)**	**13,096 (46.7)**	**368 (1.3)**	**4,242 (15.1)**	**2,320 (8.3)**	**28,045**
All	**5,185 (18.1)**	**2,470 (8.6)**	**14,487 (50.7)**	**412 (1.4)**	**4,119 (14.4)**	**1,907 (6.7)**	**28,579**

Note: Land preparation includes animal and machine labor.
Figures in parentheses are the relative share in %.

Table 26. Cost of Production and Relative Share (%) of Costs Rs. per Acre of Red Gram

Village	Land Preparation*	Seeds	Labor	FYM	Fertilizer	Pesticide	Total Cost
Kallakal	2,433 (13.1)	864 (4.6)	11,426 (61.5)	606 (3.3)	2,682 (14.4)	576 (3.1)	18,588
Jeedipally	3,167 (17.8)	1,363 (7.7)	9,896 (55.7)	200 (1.1)	2,392 (13.5)	750 (4.2)	17,767
Lingareddipet	2,721 (14.7)	1,085 (5.8)	12,039 (64.9)	95 (0.5)	1,665 (9.0)	943 (5.1)	18,547
Medak	**2,645 (14.4)**	**1,015 (5.5)**	**11,315 (61.4)**	**393 (2.1)**	**2,352 (12.8)**	**708 (3.8)**	**18,427**
Mogalagidda	2,906 (21.9)	669 (5.0)	6,688 (50.3)	0 (0.0)	2,477 (18.6)	557 (4.2)	13,295
Bhemaram	4,037 (28.2)	631 (4.4)	5,895 (41.2)	238 (1.7)	3,315 (23.2)	181 (1.3)	14,297
Chattanpalle	2,883 (19.3)	1,253 (8.4)	6,188 (41.4)	385 (2.6)	3,240 (21.7)	981 (6.6)	14,929
Rangareddy	**3,384 (23.8)**	**819 (5.8)**	**6,205 (43.7)**	**212 (1.5)**	**3,054 (21.5)**	**517 (3.6)**	**14,191**
Chegunta	4,413 (22.8)	2,053 (10.6)	6,799 (35.2)	125 (0.6)	4,332 (22.4)	1,605 (8.3)	19,326
Gajulapeta	2,808 (15.9)	1,024 (5.8)	10,622 (60.0)	362 (2.0)	2,221 (12.6)	655 (3.7)	17,693
Mudumal	3,639 (23.3)	912 (5.8)	7,996 (51.2)	0 (0.0)	2,272 (14.6)	786 (5.0)	15,605
Kotakadira	2,639 (18.8)	689 (4.9)	7,678 (54.7)	500 (3.6)	1,642 (11.7)	897 (6.4)	14,045
Zainallpur	2,187 (12.8)	701 (4.1)	9,182 (53.7)	331 (1.9)	3,984 (23.3)	719 (4.2)	17,104
Mahabubnagar	**3,300 (19.0)**	**1,221 (7.0)**	**8,606 (49.5)**	**243 (1.4)**	**3,029 (17.4)**	**980 (5.6)**	**17,380**
All	3,190 (18.5)	1,137 (6.6)	8,823 (51.3)	267 (1.5)	2,908 (16.9)	876 (5.1)	17,200

Note: Land preparation includes animal and machine labor.
Figures in parentheses are the relative shares in %.

Table 27. Cost of Production and Relative Share (%) of Costs (Rs. per Acre) of Jowar

Village	Land Preparation*	Seeds	Labor	FYM	Fertilizer	Pesticide	Total Cost
Kallakal	1,774 (16.6)	421 (3.9)	6,630 (62.0)	147 (1.4)	1,401 (13.1)	316 (3.0)	10,690
Jeedipally	2,899 (23.0)	723 (5.7)	6,451 (51.2)	199 (1.6)	2,234 (17.7)	84 (0.7)	12,589
Lingareddipet	2,254 (21.5)	263 (2.5)	5,391 (51.4)	437 (4.2)	1,482 (14.1)	661 (6.3)	10,489
Medak	**2,203 (19.8)**	**455 (4.1)**	**6,233 (56.0)**	**243 (2.2)**	**1,641 (14.7)**	**353 (3.2)**	**11,128**
Gantlavelli	1,800 (21.8)	415 (5.0)	4,600 (55.6)	0 (0.0)	1,454 (17.6)	0 (0.0)	8,269
Mogalagidda	1,892 (20.0)	622 (6.6)	4,104 (43.3)	225 (2.4)	2,602 (27.5)	34 (0.4)	9,478
Bhemaram	1,291 (11.2)	994 (8.7)	6,991 (60.9)	312 (2.7)	1,639 (14.3)	260 (2.3)	11,487
Chattanpalle	1,909 (19.7)	917 (9.5)	4,549 (46.9)	301 (3.1)	1,668 (17.2)	346 (3.6)	9,691
Rangareddy	**1,647 (15.9)**	**883 (8.5)**	**5,496 (53.2)**	**280 (2.7)**	**1,779 (17.2)**	**249 (2.4)**	**10,334**
Chegunta	1,565 (16.4)	154 (1.6)	5,010 (52.3)	0 (0.0)	2,149 (22.4)	695 (7.3)	9,573
Gajulapeta	2,367 (20.7)	496 (4.3)	6,176 (54.0)	624 (5.5)	1,558 (13.6)	208 (1.8)	11,429
Kotakadira	2,250 (17.9)	369 (2.9)	7,688 (61.1)	0 (0.0)	1,844 (14.6)	438 (3.5)	12,588
Zainallpur	1,576 (15.2)	475 (4.6)	5,838 (56.4)	281 (2.7)	1,869 (18.1)	311 (3.0)	10,350
Mahabubnagar	**1,783 (16.7)**	**457 (4.3)**	**5,966 (56.0)**	**325 (3.0)**	**1,816 (17.0)**	**316 (3.0)**	**10,662**
All	1,856 (17.4)	640 (6.0)	5,847 (54.8)	280 (2.6)	1,745 (16.4)	299 (2.8)	10,668

Note: Land preparation includes animal and machine labor.
Figures in parentheses are the relative share in %.

Table 28. Cost of Production and Relative Share (%) of Costs (Rs. per Acre) of Maize

Village	Land Preparation*	Seeds	Labor	FYM	Fertilizer	Pesticide	Total Cost
Kallakal	4,500 (29.5)	1,500 (9.8)	6,833 (44.8)	0 (0.0)	2,408 (15.8)	0 (0.0)	15,242
Jeedipally	2,611 (19.1)	567 (4.1)	7,872 (57.4)	0 (0.0)	2,656 (19.4)	0 (0.0)	13,706
Medak	**3,367 (23.5)**	**940 (6.6)**	**7,457 (52.1)**	**0 (0.0)**	**2,557 (17.9)**	**0 (0.0)**	**14,320**
Gantlavelli	3,191 (22.2)	1,233 (8.6)	7,455 (51.9)	195 (1.4)	2,153 (15.0)	150 (1.0)	14,377
Rangareddy	**3,191 (22.2)**	**1,233 (8.6)**	**7,455 (51.9)**	**195 (1.4)**	**2,153 (15.0)**	**150 (1.0)**	**14,377**
Zainallpur	3,100 (17.3)	1,550 (8.7)	8,350 (46.6)	0 (0.0)	3,900 (21.8)	1,000 (5.6)	17,900
Mahabubnagar	**3,100 (17.3)**	**1,550 (8.7)**	**8,350 (46.6)**	**0 (0.0)**	**3,900 (21.8)**	**1,000 (5.6)**	**17,900**
All	3,217 (22.2)	1,196 (8.3)	7,484 (51.7)	158 (1.1)	2,274 (15.7)	153 (1.1)	14,481

Note: Land preparation includes animal and machine labor.
Figures in parentheses are the relative share in %.

Table 29. Relative Shares of Costs across Size Classes (All Crops)

Village	% of Labor Costs					% of Fertilizer & Pesticide Costs				
	Marginal	Small	Medium	Large	ALL	Marginal	Small	Medium	Large	All
Kallakal	60.0	57.1	52.8	50.1	58.8	18.1	28.6	23.1	21.5	19.6
Jeedipally	58.0	54.3	54.1	0	57.4	15.7	27.2	24.6	0	17.1
Lingareddipet	59.1	59.3	53.4	0	58.8	17.2	25.6	16.6	0	17.6
Medak	**59.0**	**56.9**	**53.3**	**50.1**	**58.3**	**16.9**	**27.1**	**21.6**	**21.5**	**18.1**
Gantlavelli	52.5	60.3	57.6	56.2	55.2	13.3	17.2	12.0	25.7	14.2
Mogalagidda	59.4	58.8	56.7	52.6	58.5	15.5	15.0	14.0	16.4	15.2
Bhemaram	59.4	58.1	50.0	50.8	56.9	11.2	22.9	12.8	33.8	15.0
Chattanpalle	53.9	52.5	52.0	48.3	52.7	17.1	11.5	19.3	18.7	17.3
Rangareddy	**56.5**	**56.5**	**53.7**	**52.0**	**55.8**	**14.1**	**17.0**	**15.3**	**23.6**	**15.4**
Chegunta	52.2	55.0	49.2	43.5	48.3	15.5	26.8	19.0	31.1	26.6
Gajulapeta	57.0	53.8	49.8	0	53.8	13.4	27.6	20.1	0	20.1
Mudumal	55.6	55.9	47.2	54.0	53.4	19.7	30.4	21.1	21.1	23.3
Kotakadira	59.6	56.0	48.7	48.3	55.3	14.7	24.7	17.6	25.1	18.4
Zainallpur	59.4	54.5	49.2	47.3	53.8	9.8	21.6	20.3	28.6	19.4
Mahabubnagar	**57.4**	**55.0**	**48.8**	**45.5**	**52.9**	**15.0**	**26.7**	**19.7**	**29.2**	**21.6**
All	57.8	55.6	50.5	47.9	55.2	15.5	23.9	18.6	26.9	18.6

Yields rates and prices vary across the villages. Variations are greater in the case of jowar and cotton (Table 30). In the case of paddy, Mahabubnagar villages reported high yields, followed by Rangareddy and Medak. In the case of paddy price, Medak and Mahabubnagar farmers receive a better price compared to those in Rangareddy. In the case of cotton, Rangareddy and Mahabubnagar have similar yields and prices, while Medak has only one village with cotton. Mahabubnagar reported a higher price for red gram with a lower yield when compared to Medak and Rangareddy. These variations are reflected in the net returns of the crops (Figs. 11 to 15). Net

returns are substantial in the case of paddy, cotton, red gram, and maize. Jowar has very low returns. In fact, some villages have reported negative returns. Mahabubnagar has reported higher returns for paddy, cotton, and maize, while Rangareddy has reported higher net returns for red gram. **While there is no difference in net return between paddy and cotton in Mahabubnagar, cotton is more profitable than paddy in Rangareddy villages. This needs to be taken into account when looking at crop shifts.**

Table 30. Yield Rates (Quintals/Acre) and Prices (Rs./Quintal) of Important Crops

Village	Paddy	Price	Cotton	Price	Red Gram	Price	Jowar	Price	Maize	Price
Kallakal	19	1,445	0	0	5	3,777	11	2,021	17	1,808
Jeedipally	15	1,423	0	0	7	3,089	8	0	8	1,988
Lingareddipet	14	1,700	10	3,221	5	3,764	7	2,108	0	0
Medak	**15**	**1,520**	**10**	**3,221**	**5**	**2,957**	**9**	**2,056**	**14**	**0**
Gantlavelli	18	1,116	0	0	0	0	5	3,125	9	1,917
Mogalagidda	18	1,381	9	4,460	4	4,770	9	2,286	0	0
Bhemaram	15	1,384	6	5,657	4	4,344	6	1,791	0	0
Chattanpalle	15	1,387	4	5,641	7	3,638	7	2,152	0	0
Rangareddy	**17**	**1,305**	**7**	**5,158**	**5**	**4,199**	**7**	**1,994**	**9**	**0**
Chegunta	16	1,667	7	5,202	4	5,665	7	0	0	0
Gajulapeta	16	1,147	7	5,112	5	4,484	3	5,357	0	0
Mudumal	23	1,581	9	5,053	4	5,018	0	0	0	0
Kotakadira	14	1,502	0	0	4	5,727	4	2,288	0	0
Zainallpur	16	1,584	7	4,620	4	5,567	5	3,214	4	1,650
Mahabubnagar	**18**	**1,501**	**7**	**5,168**	**4**	**5,530**	**5**	**2,978**	**4**	**0**
All	17	1,468	7	5,138	4	4,346	7	2,395	9	0

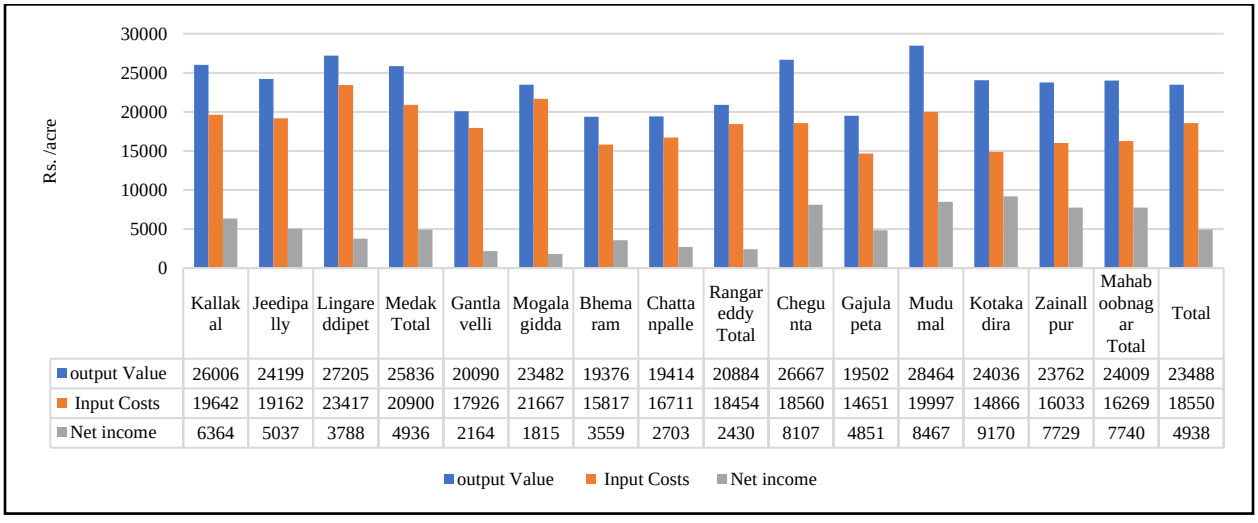
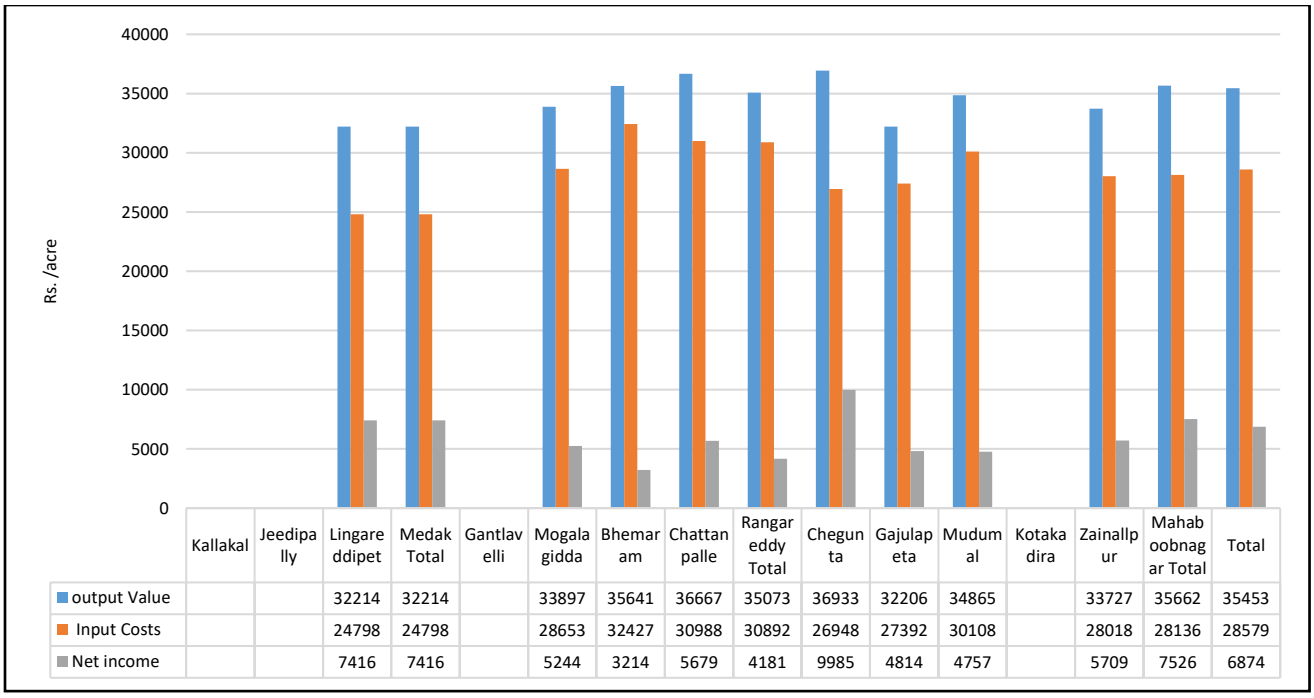
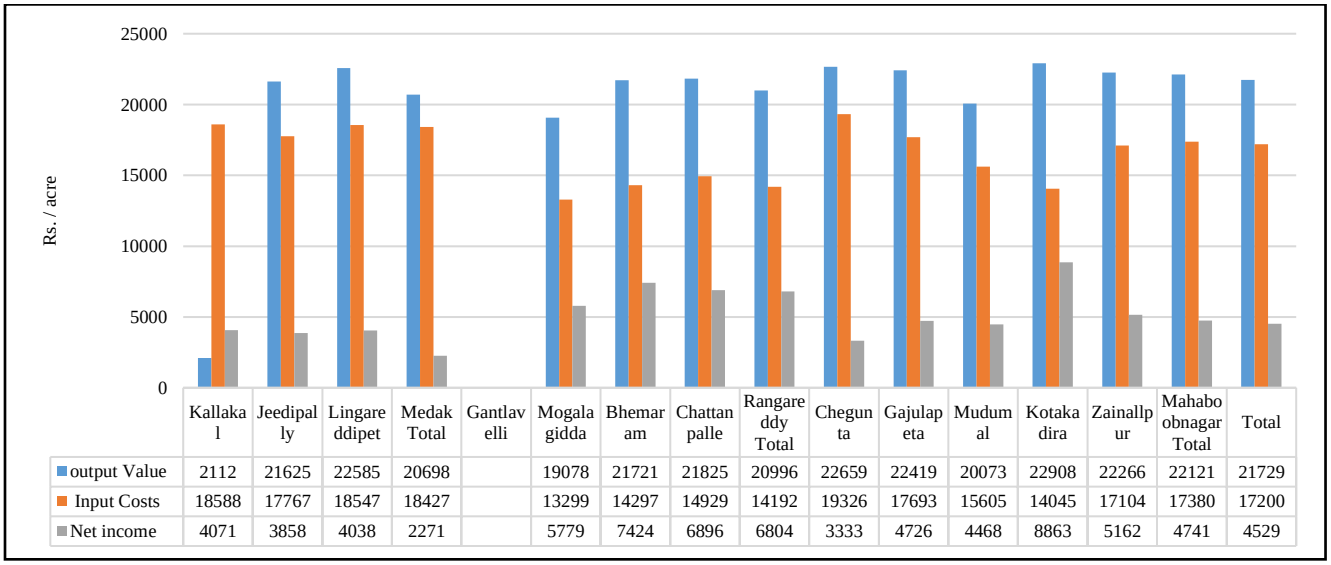


Figure 11. Gross and Net Incomes per Acre for Paddy (in Rs.)



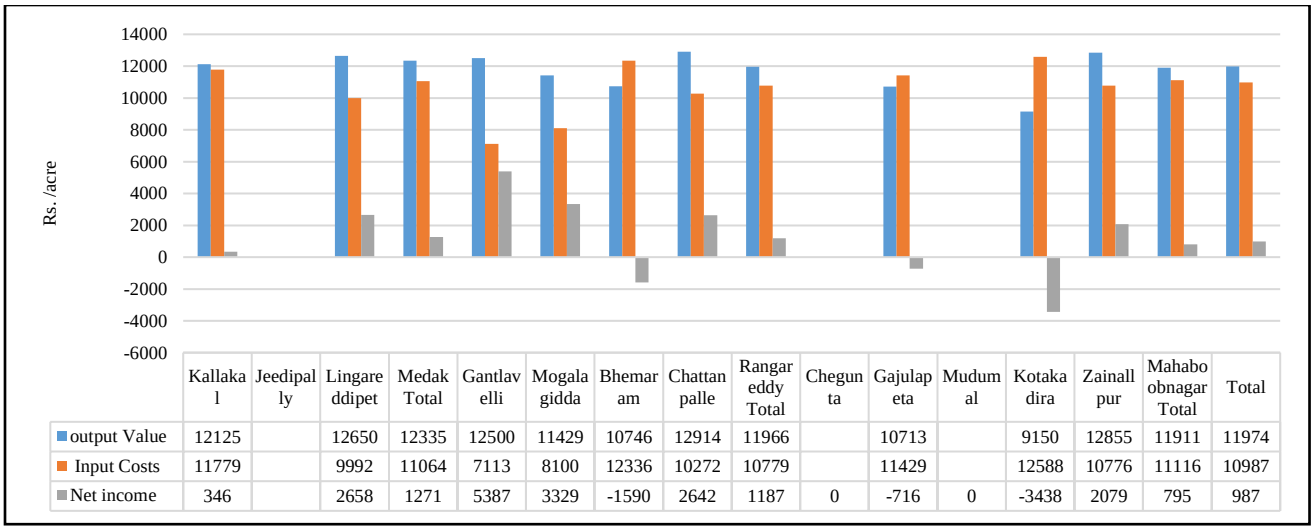
	Kallakal	Jeedipally	Lingareddipet	Medak Total	Gantlavelli	Mogaligidda	Bhemaram	Chattanpalle	Rangareddy Total	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainallpur	Mahaboobnagar Total	Total
output Value			32214	32214		33897	35641	36667	35073	36933	32206	34865		33727	35662	35453
Input Costs			24798	24798		28653	32427	30988	30892	26948	27392	30108		28018	28136	28579
Net income			7416	7416		5244	3214	5679	4181	9985	4814	4757		5709	7526	6874

Figure 12. Gross and Net Incomes per Acre for Cotton (in Rs.)



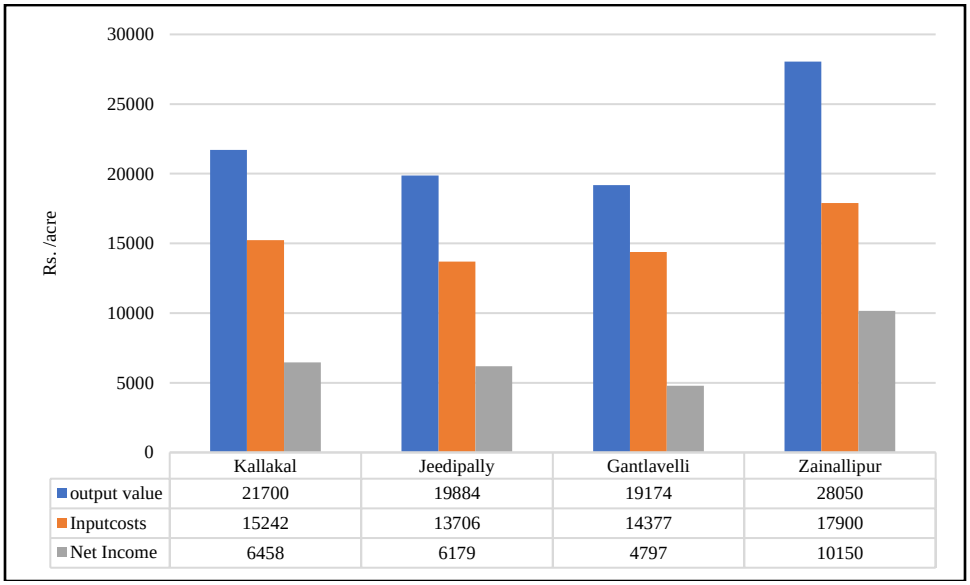
	Kallakal	Jeedipally	Lingareddipet	Medak Total	Gantlavelli	Mogaligidda	Bhemaram	Chattanpalle	Rangareddy Total	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainallpur	Mahaboobnagar Total	Total
output Value	2112	21625	22585	20698		19078	21721	21825	20996	22659	22419	20073	22908	22266	22121	21729
Input Costs	18588	17767	18547	18427		13299	14297	14929	14192	19326	17693	15605	14045	17104	17380	17200
Net income	4071	3858	4038	2271		5779	7424	6896	6804	3333	4726	4468	8863	5162	4741	4529

Figure 13. Gross and Net Incomes per Acre for Red Gram (in Rs.)



	Kallakal	Jeedipally	Lingareddipet	Medak Total	Gantlavelli	Mogaligidda	Bhemaram	Chattanpalle	Rangareddy Total	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainallpur	Mahaboobnagar Total	Total
output Value	12125		12650	12335	12500	11429	10746	12914	11966		10713		9150	12855	11911	11974
Input Costs	11779		9992	11064	7113	8100	12336	10272	10779		11429		12588	10776	11116	10987
Net income	346		2658	1271	5387	3329	-1590	2642	1187	0	-716	0	-3438	2079	795	987

Figure 14. Gross and Net Incomes per Acre for Jowar (in Rs.)



	Kallakal	Jeedipally	Gantlavelli	Zainallipur
output value	21700	19884	19174	28050
Inputcosts	15242	13706	14377	17900
Net Income	6458	6179	4797	10150

Figure 15. Gross and Net Incomes per Acre for Maize (in Rs.)

Farm size productivity has been a leading issue in Indian agriculture for quite some time. A number of studies in the 1970s and 1980s have shown that farm productivity is inversely related to farm size. The reasons include use of family labor, high input use, better supervision, etc. This has led to the conclusions that small farms are more efficient and help increase agriculture production, which favors land distribution rather than land consolidation. This relationship, however, started weakening in the later decades (Reddy, 1993). Moreover, net income rather than gross income or physical yield started showing positive tendencies. Our farm size assessment has shown that medium and large farmers have higher net returns to agriculture when compared to marginal and

small farmers (Table 31).[8] In fact, in one of the sample villages, marginal farmers reported negative net returns. This brings out two important points: **(i) what is the potential to increase the viability of marginal and small farmers who account for more than 80% of the farm households, and (ii) the need to identify appropriate crop choices, practices, technologies, etc., (GAPs) that would enhance their returns for crops.**

Table 31. Gross and Net Farm Income from All Crops (per acre)

	Marginal		Small		Medium		Large		All	
Village	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net
Kallakal	25,091	3,356	30,586	4,543	22,635	4,647	19,429	5,686	25,694	3,744
Jeedipally	36,722	4,327	16,683	2,434	27,750	6,008	0	0	33,157	4,091
Lingareddipet	23,217	5,068	28,041	7,069	35,331	9,846	0	0	24,772	5,695
Medak	**28,178**	**4,277**	**25,525**	**4,671**	**28,736**	**6,999**	**19,429**	**5,686**	**27,679**	**4,525**
Gantlavelli	19,664	7,651	19,175	7,706	12,702	3,017	17,000	6,593	18,722	7,164
Mogalagidda	22,136	7,668	19,713	6,261	29,839	7,614	29,239	8,205	23,119	7,423
Bhemaram	16,665	4,616	17,953	5,227	16,390	4,215	20,854	6,859	17,181	4,827
Chattanpalle	15,080	5,402	14,620	4,399	20,281	3,536	34,409	11,684	16,844	5,075
Rangareddy	**18,783**	**6,483**	**17,222**	**5,628**	**19,845**	**4,582**	**25,375**	**8,335**	**18,904**	**6,094**
Chegunta	35,485	7,680	30,222	10,066	27,280	8,981	26,415	10,718	27,809	9,474
Gajulapeta	22,757	4,757	18,400	4,546	16,957	5,137	0	0	19,062	4,698
Mudumal	18,559	7,207	27,867	9,978	27,024	10,766	30,625	9,694	25,464	9,512
Kotakadira	17,023	5,815	19,613	7,401	19,056	9,366	11,705	5,702	18,428	7,250
Zainallpur	12,740	-1,531	15,838	2,261	15,530	5,701	14,652	6,067	15,222	2,552
Mahabubnagar	**19,365**	**4,805**	**20,419**	**5,940**	**23,372**	**8,431**	**22,934**	**9,264**	**21,268**	**6,716**
All	22,576	5,309	20,023	5,715	22,833	7,307	23,631	8,786	21,844	6,023

Livestock Composition and Income

Livestock is one of the important sources of income in the sample villages. Livestock accounts for about 10% of household income in Medak and Rangareddy districts, while it is much less in Mahabubnagar (see Table 7). Rangareddy and Medak have a higher density of milch animals (Table 32). In all of the villages- high value milch cattle are reared for milk production. In all of the sample villages, milk is sold at dairy cooperatives and milk procurement centers. On the other hand, holdings of draft animals are marginal in all of the sample villages, though Mahabubnagar has a relatively higher density. Most of sample villages also have small ruminants, which are mainly kept for meat (commercial) and for penning (manure). Average income from livestock ranges between Rs. 3,789 in Mahabubnagar and Rs. 24,540 in Rangareddy district (Table 33). **In some villages, it is as high as Rs. 35,000 per household (Mogalagidda), where the share of livestock income in the total household income is about 20%. This indicates the high potential of livestock contribution to household income. Interestingly, small farmers appear to be**

[8] Crop-wise details are presented in Table A25 a, b, c, and d.

doing better in terms of livestock income. Enhancing household incomes through livestock rearing could be an important option, especially for marginal and small farmers. Increasing livestock holdings has the dual benefit of increasing the availability of FYM (organic matter) at the household and village levels.

Table 32. Livestock Holdings and Composition in the Sample Villages (Number and Present Value)

Village	Milch Cattle		Draft Cattle		Small Ruminants		Poultry		Pigs	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Kallakal	86	2,436,000	2	75,000	235	832,500	5	1,500	0	0
Jeedipally	52	1,690,000	4	120,000	1	3,000	18	4,800	0	0
Lingareddipet	15	441,000	0	0	32	102,000	27	5,850	0	0
Medak	**153**	**4,567,000**	**6**	**195,000**	**268**	**937,500**	**50**	**12,150**	**0**	**0**
Gantlavelli	67	5,356,000	2	160,000	31	610,000	4	1,200	0	0
Mogalagidda	143	7,702,500	6	400,000	39	456,000	20	5,000	3	15,000
Bhemaram	25	1,070,000	4	220,000	122	686,000	20	5,050	0	0
Chattanpalle	76	5,995,000	0	0	34	750,000	0	0	0	0
Rangareddy	**311**	**20,123,500**	**12**	**780,000**	**226**	**2,502,000**	**44**	**11,250**	**3**	**15,000**
Chegunta	5	88,000	10	255,000	0	0	0	0	0	0
Gajulapeta	15	263,000	0	0	268	1,756,000	26	3,900	0	0
Mudumal	8	98,000	8	117,500	2	12,000	64	19,200	0	0
Kotakadira	14	353,000	5	125,000	95	400,000	21	4,200	5	6,000
Zainallpur	14	328,000	19	498,000	49	280,000	32	8,200	0	0
Mahabubnagar	**56**	**1,130,000**	**42**	**995,500**	**414**	**2,448,000**	**143**	**35,500**	**5**	**6,000**
All	520	25,820,500	60	1,970,500	908	5,887,500	237	58,900	8	21,000

Table 33. Livestock Income (Rs./HH)

Village	Marginal	Small	Medium	Large	All
Kallakal	880	146,600	30,000	0	24,697
Jeedipally	19,107	6,250	0	0	16,970
Lingareddipet	3,704	1,500	18,000	0	4,303
Medak	**8,213**	**58,769**	**19,200**	**0**	**15,323**
Gantlavelli	12,611	60,750	80,250	30,000	33,533
Mogalagidda	19,140	91,733	32,640	40,000	35,648
Bhemaram	6,111	2,250	27,333	12,500	9,324
Chattanpalle	0	37,343	28,200	0	20,115
Rangareddy	**10,463**	**43,811**	**39,460**	**23,571**	**24,540**
Chegunta	0	0	3,158	0	1,818
Gajulapeta	4,000	11,000	8,333	0	9,030
Mudumal	0	0	556	0	152
Kotakadira	1,875	5,900	0	5,000	3,976
Zainallpur	2,200	4,500	3,333	5,000	3,970
Mahabubnagar	**1,800**	**5,476**	**3,000**	**1,429**	**3,789**

V Accelerating Farm Incomes: Potential and Constraints

Accelerating farm incomes and meeting the national objective of doubling farm incomes will involve various changes in crop profiles (pattern), agricultural practices (good and improved) to suit biophysical attributes of the region and resilience against climate risks, better access to markets and prices, etc. While the proposed project interventions plan to address these issues, this is an attempt is made to identify any potential to improve the situation (enhancing incomes) in the given context (current practices), i.e., whether there are variations in performance among the farmers and where is the gap in performance.

Yield Gap Analysis

Yield gap is assessed by comparing the maximum and minimum yield rates of sample farmers. The yield gap gives an idea the existing potential to increase the yield rates (incomes) in the given context without any structural changes, such as new crops, new cultivars, new crop practices, etc. In other words, existing yield differences are due to the adoption or non-adoption of existing practices by all the farmers, because of one or more constraints. Understanding the reasons for the yield gaps is the first step to accelerating farm income.

The descriptive statistics of the yield rates of four important crops (paddy, cotton, red gram, and jowar)[9] have shown wide intra- and inter-village variations in yield rates (Tables A18 to A22),

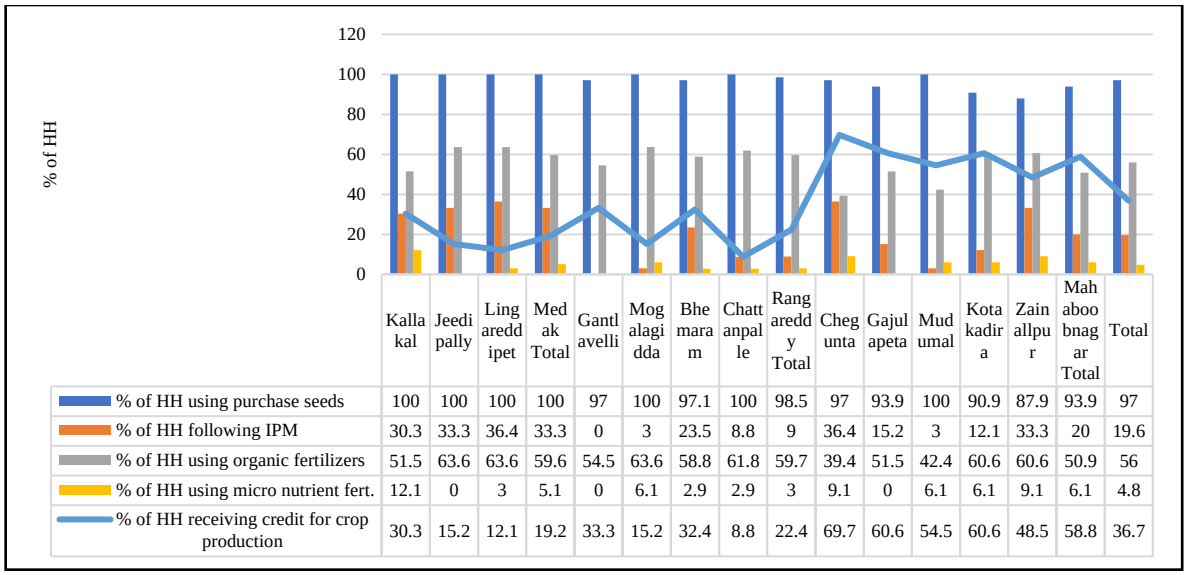
[9] Maize was not included in the analysis, as it is not grown in all the villages.

which indicate the potential for achieving higher yield rates in the given agroecological context. These four crops account for about 90% of the average farm size of the household. Given the high intra-village variations in yield rates, inter-village variations across the 12 sample villages are used (which are moderate) to assess the yield gap. The difference between minimum and maximum yields among the 12 sample villages is the yield gap. Yield gap could be calculated using different indicators, such as average, median, or mode, or standardized approaches, i.e., difference between minimum and these measures. While each approach has its merits and demerits, the min-max approach is chosen just to indicate the potential. Among the sample villages, the yield gap ranges between 3 and 4 quintals, i.e., yields can be improved from 3 to 4 quintals per acre with better or more efficient input use (Table 34). The gains from the yield improvement at the household level are calculated using the price and area under each crop. Net gains are calculated by deducting the cost of production. **Cropwise net gains range between Rs. 537 for jowar and Rs 3,514 for cotton (Table 34). Total net gain at the household level is Rs. 6,475. This accounts for 9% of the household income from agriculture. This can be further increased by reallocating the area under crops. Reallocating more area to cotton from other crops or reallocating the water from paddy (by reducing the area under paddy) increases the net gains. Gains from the latter (reallocating water) may increase the gains from cotton crop as well.**

Table 34. Yield Gaps for the Selected Crops between the Sample Districts

Yield per Acre (in quintals)	Paddy	Cotton	Red Gram	Jowar	Total
Average	16	7	5	5	--
Maximum	18	10	7	6	--
Minimum	14	6	4	2	--
Median	17	7	5	5	--
Yield gap	4	4	3	4	--
Average price (Rs./quintals)	1,468	5,138	4,346	2,395	--
Income gain (Rs./ acre)	5,872	20,552	13,038	9,580	--
Average area under the crop in the household (acres)#	1.3	0.9	0.3	0.7	3.2
Net income gain per household (Rs.) after deducting the costs	1,603 (7,633)	3,514 (18,477)	821 (13,038)	537 (6,706)	6,475 (45,854)
Net gain as % of HH income from agriculture	2 (10)	5 (24)	1 (17)	1 (9)	9 (60)

Note: Figures in parentheses are gross gain.
#Given the average farm size of the household is 3.55 acres, area under these 4 crops account for 90% of the area.



	Kallakal	Jeedipally	Lingareddipet	Medak Total	Gantlavelli	Mogaligidda	Bhemaram	Chattanpalle	Rangareddy Total	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainallpur	Mahaboobnagar Total	Total
% of HH using purchase seeds	100	100	100	100	97	100	97.1	100	98.5	97	93.9	100	90.9	87.9	93.9	97
% of HH following IPM	30.3	33.3	36.4	33.3	0	3	23.5	8.8	9	36.4	15.2	3	12.1	33.3	20	19.6
% of HH using organic fertilizers	51.5	63.6	63.6	59.6	54.5	63.6	58.8	61.8	59.7	39.4	51.5	42.4	60.6	60.6	50.9	56
% of HH using micro nutrient fert.	12.1	0	3	5.1	0	6.1	2.9	2.9	3	9.1	0	6.1	6.1	9.1	6.1	4.8
% of HH receiving credit for crop production	30.3	15.2	12.1	19.2	33.3	15.2	32.4	8.8	22.4	69.7	60.6	54.5	60.6	48.5	58.8	36.7

Figure 16. Some Indicators of Good Agricultural Practices

Assessing and understanding the constraints for reducing the yield gap is critical. Though such assessment is beyond the scope of this baseline study, an attempt was made to assess the constraints in terms of variations in the indicators of some GAPs. Four indicators of GAPs include the– use of purchased seeds, use of organic fertilizers, following integrated pest management practices, and use of micronutrients. Availability of credit for crop production is an enabling factor and, hence, credit is also a part of GAPs. Use of purchased seeds is close to 100% due to the predominance of hybrid and HYV variety crops (Fig. 16). Purchased seeds are the only choice, since a farmers using their own seeds does not work in the case of hybrid and HYV cultivars. Good quality seeds are expected to help achieve potential yields, but getting quality seeds is not fully guaranteed. This is more so in the case of commercial crops, such as cotton. While crop failure due to use of poor quality seeds is rare, it occurs regularly in commercial crops, such as cotton, chilis, and groundnut. Indian soils are low in carbon content, and hence, application of higher quantities of organic manure is highly recommended (MANAGE, 2017). Similarly, micronutrient deficiencies are also high in the Indian soils, including Telangana. While 56% of farmers use FYM along with chemical fertilizers, only 5% of the farmers apply micronutrients at the aggregate level. Across the villages, the use of FYM ranges between 42% (Mudumal) in Mahabubnagar district and 64% in Medak and Rangareddy districts. The quantity of FYM use is much less than recommended. At the same time, chemical fertilizer use is much higher than the recommended quantity, resulting in imbalanced fertilizer use. None of the farmers apply micronutrients in three of the 12 sample villages (one village in each sample district) (Fig. 16). And only 20% of the farmers have adopted integrated pest management practices at the aggregate level, ranging between 0% (Gantlavelli) and 36% (Chegunta and Lingareddipet). **This clearly indicates that there are wide variations in the adoption of GAPs despite the fact that 100% of the farmers avail credit toward crop**

production. Poor rates of GAP adoption and/or wide variations in adoption of GAPs across farmers could be a possible explanation for the yield gaps.

Factors Influencing Yield Variations

In order to find clear explanation for the yield gaps, multiple regression analysis is used. For this, yields per acre (dependent variable) of three important crops (paddy, cotton, and red gram) are regressed against various explanatory variables. All the important inputs (factors of production) along with other determinants, such as peri-urban, village, and district differences, are included as dummy variables. The following crop wise specifications are used.

$$P_{yi} = f(FS, LabU, IrriD; FertU, FYMU, PestU, MechU;\ PUD; DisD;\ VilD) + U_i \qquad (1)$$

$$P_{Ci} = f(FS, LabU, IrriD;\ FertU, FYMU, PestU, MechU;\ PUD; DisD;\ VilD) + U_i \qquad (2)$$

$$P_{RGi} = f(FS, LabU, IrriD;\ FertU, FYMU, PestU, MechU;\ PUD; DisD;\ VilD) + U_i \qquad (3)$$

Where:
P_{yi} = Paddy yield in quintals per acre for the ith farmer
P_{ci} = Cotton yield in quintals per acre for the ith farmer
P_{RGi} = Redgram yield in quintals per acre for the ith farmer
FS = Farm size in acres
IrriD = Irrigation dummy (Yes=1 and No= 0)
LabU = Labor use in man days / acre
FertU = Fertilizer use in quintals per acre
FYMU = Farm Yard Manure Use per acre in quintals
PestU = Pesticide use per acre in kg/L
MechU = Machine use per acre in hours
PUD = Peri-urban dummy (peri-urban=1; Rural=0)
DisD = District dummy (Medak=1; Rangareddy=2; Mahabubnagar=3)
VilD = Village dummy (1 to 12).
U_i = Random term

While all the input variables are theoretically expected to be positively associated with the dependent variables (yield rate), the relationship between the dummy variables and yield rates need to be explored in the absence of theoretical expectations. In the case of pesticides, the quantity used has to be separated by kilograms (solids) and liters (liquids). This could have reduced the impact on the yields. Least squares method is used to estimate the specifications. The number of combinations and permutations were tried and only best fits, in terms of a number of variables significant and explanatory power of the specifications, are discussed here while the other estimates are presented in Tables A23-A25. Linear and log-linear functions were also tried. Linear estimates were retained, as the log-log formulations were not found to be efficient, especially in terms of a number of significant variables. Moreover, log-linear formulations are not possible in the case of cotton and red gram due to the presence of zero values in the case of some inputs. In

the case of paddy, double log formulations have performed better in terms of explanatory power (R^2) but none of the variables turned out to be significant and thus were not retained. Multi-collinearity problem was addressed using VIF statistic, i.e., retaining the specifications with <2 VIF value. The regressions were estimated using the SPSS package. The estimates of the selected specifications are presented in Table 35.

Table 35. Regression Results (Dependent Variable: Yield per Acre)

Independent Variable	Paddy		Cotton		Red Gram	
	Coefficient	t value	Coefficient	t value	Coefficient	t value
(Constant)	9.262*	4.047	4.631*	3.547	3.138*	2.932
Farm Size	---	---	-0.159*	-2.392	-0.286	-1.433
Fertilizer Use	0.557	0.922	0.731***	1.677	---	---
Labor use	0.109**	2.299	---	---	---	---
Pesticide use (kgs)	-0.938	-0.625	2.462*	2.626	---	---
Pesticide use (ltrs)	---	---	0.788***	1.595	1.572**	2.104
Irrigation Dummy	2.300***	1.790	---	---	-1.761**	-2.316
Village Dummy	0.058	1.410	1.068	1.193	---	---
District Dummy	---	---	-0.418	-1.129	1.054*	2.271
N	253		84		60	
R Square	0.04		0.17		0.23	
VIF	<1.1		<1.58		<1.20	

Note: *; **, and *** indicate levels of significance at 1%, 5%, and 10-11%, respectively.

At the outset, the regression estimates are not very encouraging though they provide some pointers. The explanatory power of the specifications often tend to be low when using household-level data. In the present case, the explanatory power turned out to be very low for paddy crop. This is despite paddy having highest number of observations. Though log-log formulations have provided higher explanatory power (>70%), none of the variables turned out to be significant. All the variables have shown theoretically expected signs for all the three crops, except the irrigation variable in the case of red gram. Labor use and irrigation variables turned out to be significant with positive sign. The importance of irrigation for paddy crop need not be over emphasized. Labor use is also positively associated with paddy yield, indicating that there is a possibility of increasing labor use in paddy cultivation. This could be due the labor shortages in the villages, especially after the introduction of employment programs, and the cost of labor. Fertilizer and pesticide use turned out be positive and significant in the case of cotton crop. This indicates that better **soil nutrition and pest management practices could help enhance cotton yields and incomes.** There is an inverse relationship between farm size and cotton yield, indicating that marginal and small farmers are doing better than medium and large farmers. This, however, does not mean that marginal and small farmers make more profits. The absence of such an inverse relationship in the case of the other two crops clearly shows that **the relationship is not universal, as it holds good only in one out of three crops.** In the case of red gram, pesticide use also turned out be positive and significant, indicating the role of pest management in the case of red gram as well. The irrigation variable turned out to be negative, which is difficult to explain. Perhaps this could be interpreted as the

need for irrigation is not that crucial in the case of red gram, which grows during kharif season. In the event of reallocation of water (by reducing area under paddy), red gram need not be a priority. District dummy turned out significant, which reflects the inter-district variations in red gram yields. Overall, the regression estimates indicate the potential for improving input management for enhanced crop performance. **The GAPs need to focus on soil nutrition and pest management practices. Reallocation of water to other crops needs to be better understood.**

VI Summary and Way Forward

The main purpose of the baseline study is to provide guidance on the proposed interventions or GAPs for accelerating the farm incomes in the sample districts and form the basis for monitoring and evaluation of the project interventions. The baseline study was carried out in the three program districts of Mahabubnagar, Medak, and Rangareddy districts. From these districts, 12 villages were selected, representing peri-urban and rural locations. The number of villages selected from each district was based on the size of the target population (farming households). Accordingly, three villages from Medak, four villages from Rangareddy, and five villages from Mahabubnagar were selected. Of these, six villages each represent peri-urban and rural contexts. A sample of 33 households from each village was selected proportionately to the distribution of farm-size class in the village. Altogether, a sample of 397 farm households was selected, which is 1.3% of the total target population of the program (30,000). Both qualitative and quantitative research techniques were used to elicit information at the village/community and household levels. Yield gaps and factors influencing the variations in yields across households were analyzed in order to attain a deeper understanding of the potential and constraints for accelerating farm incomes.

The analysis helped in understanding the context, status, potential, and constraints for improving farm incomes in the selected districts. The following summarizes some of the important aspects in this regard. These should be taken into consideration when designing future interventions.

1. Some of the peri-urban villages are fast becoming urban in nature, as agriculture is no longer a priority. Farmers are more interested in non-farm avenues and unlikely to continue agriculture and learn good agriculture practices. In fact, there may not be much cultivable land left for agriculture. While planning the interventions, the ***villages need to be assessed for their interest in and demand for such interventions in order to avoid inefficient use of resources.***
2. Land is not a constraining factor, while water is a constraint. Water use efficiency is low, since most farmers allocate their water to water-intensive paddy and adopt flood irrigation. Though some farmers use micro irrigation, it is mainly due to the subsidies they receive and the area covered is marginal. ***There is good scope for improving water use efficiency and crop production through promotion of less water-intensive crops. Given the water scarcity coupled with a heavy dependence on groundwater, there is potential to promote micro irrigation in the sample region.***

3. Marginal and small farmers account for more than 75% of the farming households. They do not appear to have advantages in terms of access to resources, use of inputs (including labor), access to markets, etc. They no longer have the edge over medium and large farmers in terms of yield rates (land productivity). They are also at a disadvantage in terms of net returns. ***Focusing the interventions on these farmers would provide a better return on investment.***
4. All the sample villages adopt a combination of two crops, such as paddy-pulses (red gram); paddy-jowar; cotton-pulses (red gram); and paddy-maize. There have been no major changes in the cropping pattern in recent years. Only paddy and a few vegetables are grown during rabi season and the crop intensities are about 120%. ***Reallocation of water may help increasing the crop intensities. At present, the area under vegetable crops is very marginal; the scope for increasing the area under vegetable, especially in the peri-urban locations, needs to be assessed and promoted for improved incomes. There is a clear opportunity for reallocating water to increase farm income through choosing appropriate crops and methods of irrigation.*** *A s****hift away from paddy to low water-intensive crops with micro irrigation could substantially improve the area under protective irrigation and crop yields. Even the existing crops of cotton and maize could be provided with one or two irrigations, which would enhance their productivity substantially.***
5. Present input use is highly biased toward chemical fertilizers with nominal organic (FYM) applications. ***Farmers are not familiar with using other organic manures, such as vermicomposting, green manure, or biochar. There is a clear need to increase the application of organic matter (at least doubling). Promoting vermicomposting and green manure preparation activities at the household level for self-consumption as well as a business model could be explored.***
6. Labor is the single largest component of the cost composition. Lately, labor has become a constraining factor in the labor surplus economy. Any crop changes or technology interventions need to take this into account. ***Labor-intensive (even marginally) crop practices may not be acceptable or sustainable.*** Profit gains must be substantial in order to make them adoptable.
7. Given the low share of fertilizers in the total cost composition, there is little incentive to reduce or fertilizer consumption or use efficient fertilizer technologies. At the same time, improved soil nutrition management could enhance the productivity of crops, such as cotton. ***Building awareness among farmers might help adoption of GAPs in this regard.***
8. At the aggregate level, maize is the most profitable crop although it is not grown everywhere. ***Constraints for expanding the area under maize need to be explored.***[10] However, blanket crop shifts may not be sustainable, as observed in the case of paddy and cotton in Mahabubnagar. While cotton is more profitable than paddy in most locations, they are equal in Mahabubnagar.

[10] In some villages of Medak district, farmers do not grow maize and vegetable crops, despite being profitable, because of wildlife menace, i.e., wild boars and monkeys destroy these crops.

9. Access to markets in the sample villages continues to be traditional (high dependence on traders and middlemen). Very few farmers use public market yards for good reason. Farmers neither use nor are aware of e-markets or linked directly to urban markets/supermarkets. There are no FPOs functioning in the region. In the absence of evolved market systems it is difficult to promote new crops, such as vegetables. ***Establishing better market linkages with improved price realization is critical for improving farm incomes.***
10. The yield gap analysis indicates that there are wide variations in yields of different crops. These variations could be observed within the village, among the villages, and among the districts. This points to the potential for increasing the yield rates in the given agroecology and technological context. ***Bridging the yield gaps through adoption of GAPs in the present crop systems could result in a 9% increase in household income from agriculture. This can be further increased by reallocating the area under crops. Reallocating more area to cotton from other crops or reallocating the water from paddy (by reducing the area under paddy) to other crops could further increase the net gains. Gains from the latter (reallocating water) may increase the gains from cotton crops as well.***
11. There are wide variations in adoption of some GAPs across the farm households, villages, and districts. ***Low rates of GAP adoption and/or wide variations in the adoption of GAPs across farmers indicate the potential for reducing the yield gaps through building awareness and capacities.***
12. Factors explaining the variations in yield rates suggest that better soil nutrition and pest management practices could help enhance yields and incomes from crops like cotton. Overall, there is potential for improving input management for enhanced crop performance. ***GAPs need to focus on soil nutrition and pest management practices. At the same time, labor and water are the main constraints and, hence, adoption of labor- and water-saving methods[11] and approaches would be acceptable to the farming communities.***
13. Apart from crop production, livestock rearing is a potential source of income. In some of the sample villages, the share of livestock income in total household income is as high as 20%. Identifying the potential and constraints for increasing the share of livestock in the other villages could be a viable proposition. ***Increasing livestock holdings has the dual benefits of increasing the availability of farmyard manure (organic matter) and providing regular cash flow at the household and village levels. Small farmers also appear to gain more from livestock rearing.***
14. Analysis of labor contribution in crop production confirms the "feminization of agriculture" argument, as women labor account for two-thirds of total labor use in crop production. Some of the villages also have substantial number of women farmers. ***Women farmers/workers face different problems when compared to their male counterparts, and hence, their needs are***

[11] Water-saving micro irrigation systems (drip and sprinkler) are capital intensive, and marginal and small farmers need financial support or institutional arrangement (group ownership) need to be implemented to overcome the financial constraints.

expected to be different. Understanding their requirements and providing exclusive support (training and technologies) to them is critical for improving their conditions.

This baseline assessment provides insights into the status and context of the three sample districts. Further, it provides the baseline information on a set of indicators for the purpose of monitoring and evaluation of the interventions in the future. Crop production in the sample villages is driven by resource and market constraints, with little or no support from extension services. As a result, resource allocation inefficiencies and unsustainable farm practices are widespread. There is potential to increase farm income through better allocation of resources, enhancing input productivities and greater price realization. Improving water use efficiency through shifting to low water-intensive crops, and water-saving techniques (micro irrigation). This could be achieved within the existing cropping pattern and/or by introducing new crop/farming systems that are acceptable and profitable to the farmers. Livestock farming is a viable complementary livelihood activity, which requires water, fodder, and market support. Labor availability appears to be a major constraint in these villages, and hence, any new intervention must take this into account. Improving access to markets and creating value chains need a broader policy push. Promotion of FPOs and other direct marketing arrangements at the village or cluster level could be prioritized. This would incentivize farmers to shift to non-traditional crops, such as vegetables, that are less water intensive and more remunerative.

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Appendices

Table A1. Land and Water Resources of the Sample Households in the Sample Villages

Particulars		Village															
		Kallakal	Jeedipally	Lingareddipet	Medak	Gantlavelli	Mogalagidda	Bhemaram	Chattanpalle	Rangareddy	Chegunta	Gajulapeta	Mudumal	Kotakadira	Zainallpur	Mahabubnagar	All
Land Resources (acres)	Total Cultivated Land	70.4	47.8	58.8	176.9	107	108	132.9	120.8	468.8	272.	99.7	139	125	129	765.3	1411
	Homestead Area	3.3	3.2	3.4	9.9	4.3	3.0	2.5	2.8	12.6	2.7	3.3	3.7	4.3	2.1	16.1	38.6
	Fallow Land	5.5	5.3	1.5	12.3	5.6	1.0	3.7	22.0	32.3	11.5	12.8	3.0	10.2	9.5	47.0	91.6
	Leased-out land		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Leased-in land	2.0	20.0	2.0	24.0	7.0	3.0	2.0	0.0	12.0	24.0	0.0	24.0	0.0	0.0	48.0	84.0
	Share cropped area	0.0	0.0	1.0	1.0	0.0	0.0	0.0	5.0	5.0	2.0	0.0	1.0	0.0	0.0	3.0	9.0
	Area under Single crop	49.6	30.0	47.2	126.8	60.0	61.3	112.1	105.3	338.6	150.7	60.4	69.5	60.1	56.9	397.5	862.8
	Area under double crop	5.2	14.2	13.1	32.6	40.8	37.9	9.0	10.5	98.2	2.0	16.5	36.0	10.0	35.2	99.7	230.4
	Fish pond area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Homestead Forest area	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.4	0.8	0.0	0.0	0.0	2.1	0.5	2.6	3.4
	Area irrigated	54.3	42.8	46.8	143.9	55.3	81.7	25.0	63.0	225.0	5.0	35.5	96.5	93.5	56.1	286.6	655.5
	Source of irrigation (code)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Irrigated Own land	52.3	42.8	44.8	139.9	53.3	78.7	25.0	63.0	220.0	5.0	35.5	76.5	93.5	56.1	266.6	626.5
	Irrigated rented –in	2.0	0.0	2.0	4.0	2.0	3.0	0.0	0.0	5.0	0.0	0.0	20.0	0.0	0.0	20.0	29.0
Area Irrigated (Acres)	*Kharif*	66.8	63.9	104.0	234.7	101.6	93.5	132.5	119.8	447.3	285.8	99.5	152.4	122.3	117.9	777.9	1460.0
	Rabi	1.0	5.2	9.4	15..6	19.6	23.8	8.0	3.0	54.4		3.0	18.3	7.3	27.0	55.6	125.6
	Summer					1.0				1.0							1.0

*There is no data for no of open wells, bore wells and depth of water.

Table A2. Type of House and Household Amenities

Village	% of HH with cement house	% of HH with electricity	% of HH having tap water at home	Average value of house (Rs.)
Kallakal	57.6	100	75.8	543030
Jeedipally	60.6	100	72.7	502727
Lingareddipet	60.6	100	84.8	435152
Medak	59.6	100	77.8	493636
Gantlavelli	45.5	100	75.8	588182
Mogalagidda	48.5	100	45.5	767576
Bhemaram	55.9	100	55.9	626471
Chattanpalle	94.1	100	38.2	1396324
Rangareddy	61.2	100	53.7	847127
Chegunta	60.6	100	63.6	323636
Gajulapeta	48.5	100	66.7	256818
Mudumal	48.5	100	66.7	283182
Kotakadira	72.7	100	66.7	363485
Zainallpur	57.6	100	42.4	420000
Mahabubnagar	57.6	100	61.2	329424
All	59.3	100	62.8	544573

*No data for cement roof and cement floor.

Table A3. Movable Assets per Household: Present Value(in Rs. Average/HH Radio, TV, Automobile, Vehicles, Bicycles, Machines, Mobiles, Chairs, Tables, Refrigerator)

Village	Marginal	Small	Medium	Large	All
Kallakal	49560	183440	84500	100800	73515
Jeedipally	75946	97700	571400	0	93597
Lingareddipet	47931	109225	31800	0	54383
Medak	58246	134223	160800	100800	73832
Gantlavelli	37747	184863	56275	42650	75955
Mogalagidda	52953	48917	10160	55350	45880
Bhemaram	30669	44144	51608	584650	70122
Chattanpalle	91104	121650	211700	753450	160378
Rangareddy	50181	106351	82203	359025	88489
Chegunta	61450	71433	39529	85822	56383
Gajulapeta	41943	32673	71150	0	41635
Mudumal	48900	22373	43556	90600	36648
Kotakadira	51669	30964	99300	70300	48721
Zainallpur	79660	42285	46967	123600	53727
Mahabubnagar	53978	34295	52183	89343	47423
All	54398	65440	68519	183643	67818

Table A4. Assets-Agriculture Implements: Present Value (in RS. Average/HH)

Village	Marginal	Small	Medium	Large	All
Kallakal	43200	60000	0	0	41818
Jeedipally	78464	140000	75000	0	85818
Lingareddipet	37722	360250	533000	0	106833
Medak	53694	177000	228200	0	78157
Gantlavelli	40263	21625	25000	50000	34485
Mogalagidda	8250	17833	13000	30000	12030
Bhemaram	2500	3125	83333	107500	23088
Chattanpalle	5769	44429	44000	62500	30647
Rangareddy	15000	25750	44250	62500	25090
Chegunta	2750	0	42526	259000	95288
Gajulapeta	0	45575	90417	0	44061
Mudumal	16063	10800	54556	0	23682
Kotakadira	34125	10056	124000	64250	36439
Zainallpur	400	15600	274167	170000	69667
Mahabubnagar	13633	20612	91256	199964	53827
All	31969	38356	87607	143457	50204

Table A5. Sanitation and Hygiene Status

Village	% HH hand washing	% HH using private toilet	% HH using shared toilet	% HH using public toilet	Material used for hand wash by majority HHs	Type of toilet used by majority of HHs
Kallakal	93.9	87.9	12.1	0.0	Soap	Indian
Jeedipally	93.9	87.9	12.1	0.0	Soap	Indian
Lingareddipet	84.8	87.9	12.1	0.0	Soap	Indian
Medak	90.9	87.9	12.1	0.0		
Gantlavelli	90.9	100.0	0.0	0.0	Soap	Indian
Mogalagidda	93.9	97.0	0.0	3.0	Soap	Indian
Bhemaram	91.2	100.0	0.0	0.0	Soap	Indian
Chattanpalle	100.0	100.0	0.0	0.0	Soap	Indian
Rangareddy	94.0	99.3	0.0	0.7		
Chegunta	75.8	87.9	9.1	3.0	Soap	Indian
Gajulapeta	72.7	87.9	12.1	0.0	Soap	Indian
Mudumal	78.8	93.9	6.1	0.0	Soap	Indian
Kotakadira	78.8	90.9	9.1	0.0	Soap	Indian
Zainallpur	90.9	87.9	12.1	0.0	Soap	Indian
Mahabubnagar	79.4	89.7	9.7	0.6		
All	87.2	92.5	7.0	0.5		

Table A6. Awareness about Nutrition and Consumption of Nutritious Food

Village	% HH Knowledge about nutrition	Average consumption (kg/no./L) per week						
		Meat (kg)	Fish (kg)	Eggs (no.)	Pulses (kg)	Milk (L)	Vegetables (kg)	Fruits (kg)
Kallakal	45.5	1.1	0.8	9.2	1.1	4.6	5.7	1.8
Jeedipally	30.3	1.2	0.5	10.0	1.0	3.9	5.6	1.7
Lingareddipet	18.2	1.0	0.6	9.2	0.9	3.7	5.5	1.2
Medak	31.3	1.1	0.6	9.4	1.0	4.0	5.6	1.5
Gantlavelli	57.6	0.7	0.1	6.2	1.0	3.6	3.1	1.4
Mogalagidda	75.8	0.8	0.0	6.7	0.8	4.7	3.0	1.4
Bhemaram	85.3	0.5	0.0	4.6	0.8	2.8	2.9	1.2
Chattanpalle	85.3	0.7	0.0	5.7	0.6	5.3	2.8	1.5
Rangareddy	76.1	0.7	0.0	5.8	0.8	4.1	3.0	1.4
Chegunta	39.4	0.6	0.4	5.0	1.4	4.3	6.1	1.6
Gajulapeta	15.2	1.4	0.9	7.8	1.2	4.0	5.5	1.3
Mudumal	21.2	1.0	1.5	8.2	1.2	3.7	5.8	1.6
Kotakadira	33.3	1.4	0.9	8.4	1.2	3.9	5.5	1.8
Zainallpur	27.3	1.0	0.6	7.5	1.4	3.9	6.0	1.8
Mahabubnagar	27.3	1.1	0.9	7.4	1.3	4.0	5.8	1.6
All	44.7	0.9	0.5	7.4	1.0	4.0	4.8	1.5

Table A7. Average Number of Crops grown by the Sample Households

Village	Marginal	Small	Medium	Large	All
Kallakal	2	2	2	1	2
Jeedipally	1	1	2	0	1
Lingareddipet	1	2	4	0	2
Medak	1	2	3	1	2
Gantlavelli	2	3	2	3	2
Mogalagidda	2	4	2	3	2
Bhemaram	2	2	3	4	2
Chattanpalle	1	2	3	3	2
Rangareddy	2	3	2	3	2
Chegunta	1	1	1	2	1
Gajulapeta	1	2	2	0	2
Mudumal	1	1	2	2	1
Kotakadira	1	1	1	1	1
Zainallpur	2	2	2	3	2
Mahabubnagar	1	2	2	2	1
All	1	2	2	2	2

Table A8. Number of Farmers Growing and Area under Vegetable and Fruit Crops among the Sample Households

Village	Vegetable Crops		Fruit Crops	
	No. of Farmers	Area in Acres	No. of Farmers	Area in Acres
Jeedipally	2 (0.6)	1.1	0	0
Kallakal	1(0.1)	0.1	0	0
Lingareddipet	6 (0.8)	4.5	0	0
Medak	9 (0.6)	5.7	0	0
Chattanpalle	5 (0.6)	3.0	0	0
Gantlavelli	9 (0.6)	5.3	1 (2)	2
Mogalagidda	3 (0.4)	1.2	0	0
Bhemaram	0	0	1 (3)	3
Rangareddy	17 (0.6)	9.5	2 (2.5)	2.5
All	26 (0.6)	15.2	2 (2.5)	5

Note= Figures in brackets are average area per farmer.

Table A9. Cropwise Irrigation Details (Total)

Village	Crop	Season	Source (GW/ surface)	Method (Drip/ sprinkler/ Flood)
Kallakal	Paddy	kharif	4	1
Jeedipally	Paddy	kharif	4	1
Lingareddipet	Paddy	kharif	4	1
Gantlavelli	Paddy	kharif	4	1
Mogalagidda	Paddy	kharif	3	1
Bhemaram	Paddy	kharif	3	1
Chattanpalle	Paddy	kharif	3	1
Gajulapeta	Paddy	kharif	4	1
Mudumal	Paddy	kharif	4	1
Kotakadira	Paddy	kharif	4	1
Zainallpur	Paddy	kharif	4	1

Note: Use codes Source code: 1= canal; 2= Deep Tube Well; 3= Shallow Tube Well; 4= LLP;
Method: 1= Flood; 2= drip; 3= Sprinkler.

Table A10. Percentage of Farmers Testing Soils and Adopting the Recommended Practices

Village	Tested	Adopted
Kallakal	0	0
Jeedipally	3	0
Lingareddipet	4	0
Medak	2	0
Gantlavelli	2	0
Mogalagidda	1	1
Bhemaram	2	0
Chattanpalle	3	0
Rangareddy	2	0.3
Chegunta	5	2
Gajulapeta	3	1
Mudumal	1	0
Kotakadira	4	0
Zainallpur	1	1
Mahabubnagar	3	1

Table A11. Cropwise Coverage of HYV and Hybrid Seeds (% of Farmers Using)

	Paddy			Cotton			Jowar			Red Gram			Maize		
Village	HYV	Hybrid	Local	HYV	Hybrid	Local	HYV	Hybrid	Local	HYV	Hybrid	Local	HYV	Hybrid	Local
Kallakal	71	19	10	0	0	0	20	70	10	29	14	57	50	46	5
Jeedipally	50	46	4	0	0	0	33	67	0	50	50	0	50	50	0
Lingareddipet	39	62	0	100	0	0	14	71	14	33	33	33	0	0	0
Medak	52	44	4	100	0	0	22	70	9	33	25	42	50	47	3
Gantlavelli	13	58	29	0	0	0	0	67	33	0	0	0	4	88	8
Mogalagidda	13	87	0	0	100	0	0	0	100	33	67	0	0	0	0
Bhemaram	17	83	0	0	100	0	20	40	40	0	100	0	0	0	0
Chattanpalle	7	87	7	0	100	0	0	100	0	0	100	0	0	0	0
Rangareddy	12	77	11	0	100	0	13	47	40	13	88	0	4	88	8
Chegunta	75	25	0	55	45	0	0	50	50	0	64	36	0	0	0
Gajulapeta	57	43	0	20	80	0	0	20	80	25	42	33	0	0	0
Mudumal	75	8	17	76	24	0	0	0	0	43	43	14	0	0	0
Kotakadira	59	32	9	0	0	0	0	33	67	33	67	0	0	0	0
Zainallpur	27	55	18	0	100	0	25	0	75	50	25	25	60	40	0
Mahabubnagar	57	33	10	59	41	0	15	12	73	24	49	27	60	40	0
All	39	52	8	41	59	0	17	41	42	25	49	26	40	56	4

Table A12. Source of Fertilizers and Mode of Payment

Village	% of HH Buying Fertilizer from Merchants	% of HH Buying Fertilizer from Dealers	% of HH Buying with Cash	% of HH Receiving Advisory Services	% HH with Membership in a Group
Kallakal	69.7	3.0	97.0	0.0	0.0
Jeedipally	90.9	3.0	97.0	0.0	0.0
Lingareddipet	87.9	0.0	100.0	0.0	0.0
Medak	82.8	2.0	98.0	0.0	0.0
Gantlavelli	6.1	93.9	100.0	9.1	0.0
Mogalagidda	6.1	93.9	100.0	3.0	0.0
Bhemaram	0.0	100.0	100.0	0.0	0.0
Chattanpalle	5.9	94.1	100.0	0.0	0.0
Rangareddy	4.5	95.5	100.0	3.0	0.0
Chegunta	97.0	0.0	97.0	12.1	3.0
Gajulapeta	90.9	3.0	100.0	0.0	12.1
Mudumal	81.8	3.0	90.9	6.1	0.0
Kotakadira	78.8	3.0	93.9	0.0	0.0
Zainallpur	97.0	3.0	100.0	6.1	0.0
Mahabubnagar	89.1	2.4	96.4	4.8	3.0
All	59.0	33.7	98.0	3.0	1.3

Table A13. Use of Fertilizers (per acre): Paddy Crop (Kharif Season)

Villages	Urea		DAP		SSP		TSP		MOP	
	Quantity (Qt)	Cost (Rs.)	Quantity (Qt)	Cost (Rs.)	Quantity (Qt)	Cost (Rs.)	Quantity (Qt)	Cost (Rs.)	Quantity (Qt)	Cost (Rs.)
Kallakal	1.63	1292	1.31	3085	0.75	750	0.94	1481	0.55	783
Jeedipally	1.63	1085	1.37	3478	0	0	1.28	2000	0.84	1422
Lingareddipet	1.76	1229	1.23	2612	0.75	750	1.00	1600	0.33	667
Medak	1.68	1201	1.30	3019	0	0	1.06	1680	0.66	1063
Gantlavelli	1.14	588	1.23	2347	0	0	0.53	932		
Mogalagidda	1.66	899	1.10	2376	0	0	0.53	753	0.17	320
Bhemaram	1.21	671	1.21	2690	1.00	900	0.58	1092	0.17	333
Chattanpalle	0.94	646	0.70	1640	1.00	900	0.50	800	0.61	1354
Rangareddy	1.27	709	1.07	2253	0	0	0.54	890	0.46	1012
Chegunta	0	0	0	0	0.25	500	0	0	0	0
Gajulapeta	1.38	852	0.84	1635	0	0	0.29	582	0.54	930
Mudumal	1.67	1035	0.91	2155	0.34	306	0.54	975	0.61	1275
Kotakadira	1.50	881	1.15	2570	0.25	250	0.63	729	0.48	1073
Zainallpur	1.74	844	1.22	2042	0.29	340	0.38	700	0.37	671
Mahabubnagar	1.54	892	1.04	2163	0.53	537	0.50	712	0.51	1039
All	1.50	943	1.14	2510	0.75	750	0.69	1065	0.55	1042

Table A14. Use of Fertilizers (per acre): Cotton Crop

Village	Marginal	Small	Medium	Large	All
Lingareddipet	0	0	2.0	0	2.0
Medak	0	0	2.0	0	2.0
Mogalagidda	2.1	1.8	1.7	2.9	2.0
Bhemaram	1.9	2.2	2.8	2.8	2.4
Chattanpalle	0	2.3	0	0	2.3
Rangareddy	2.0	2.1	2.3	2.8	2.2
Chegunta	2.2	2.3	2.5	2.4	2.4
Gajulapeta	1.1	2.8	1.7	0	1.9
Mudumal	2.7	2.0	2.5	2.5	2.3
Zainallpur	0	0	2.5	0	2.5
Mahabubnagar	2.1	2.1	2.5	2.4	2.3
Total	2.1	2.1	2.4	2.5	2.3

Table A15. Use of Fertilizers (per acre): Red Gram Crop

Villages	Urea		DAP		SSP		TSP		MOP	
	Quantity (Qt)	Cost (Rs.)	Quantity (Qt)	Cost (Rs.)	Quantity (Qt)	Cost (Rs.)	Quantity (Qt)	Cost (Rs.)	Quantity (Qt)	Cost (Rs.)
Kallakal	1.01	658	1.08	2454	0	0	1.33	1333	0	0
Jeedipally	0.5	350	0.92	2200	0	0	0	0	0	0
Lingareddipet	1.25	965	1.00	2150	0	0	0	0	0	0
Medak	1.26	915	1.03	2325	0	0	1.33	1333	0	0
Gantlavelli	0	0	0	0	0	0	0	0	0	0
Mogalagidda	0.89	576	1.04	2425	0	0	0.79	787	0	0
Bhemaram	1.17	727	1.00	2325	0	0	0	0	0	0
Chattanpalle	1.00	600	0.75	1800	0	0	0	0	0	0
Rangareddy	1.05	655	0.95	2218	0	0	0.79	787	0	0
Chegunta	0.74	491	0.70	1764	0	0	0.53	600	0	0
Gajulapeta	0.90	565	0.85	1862	0.80	800	0.83	833	0	0
Mudumal	0.52	331	0.47	1269	0	0	0.25	250	1.0	900
Kotakadira	1.04	493	0.75	1767	0	0	0.25	250	0	0
Zainallpur	1.17	513	1.04	2313	0.50	500	0.58	583	0.8	725
Mahabubnagar	0.81	487	0.75	1764	0.65	650	0.55	573	0.8	783
All	0.86	536	0.83	1928	0.65	650	0.73	751	0.8	783

Table A16. Use of Fertilizers (per acre). Jowar crop

Village	Marginal	Small	Medium	Large	All
Kallakal	0.8	1.1	1.4		1.1
Jeedipally	1.3	0	0	0	1.3
Lingareddipet	0.9	1.1	1.7	0	1.2
Medak	1.1	1.1	1.6	0	1.2
Gantlavelli	1.0	0.8		1.1	1.0
Mogalagidda	0.8	0.9	1.1	1.3	1.0
Bhemaram	1.2	1.5	0.5	1.5	1.1
Chattanpalle	0.7	1.2	1.5	1.2	1.2
Rangareddy	1.1	1.1	0.9	1.3	1.1
Chegunta	0	0	1.5	1.0	1.3
Gajulapeta	0	1.3	0	0	1.3
Kotakadira	0	1.2	0	0	1.2
Zainallpur	1.0	1.2	0.9	1.5	1.1
Mahabubnagar	1.0	1.2	1.0	1.3	1.2
All	1.1	1.2	1.1	1.3	1.2

Table A17. Allocation of labor by activity (average per household)

	Land Preparation		Seeding/ Transplanting		Fertilizer Application		Weeding		Irrigation		Pesticide		Harvesting		Post-Harvest Tasks*	
Village	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W
Kallakal	2.2	1.0	3.1	7.0	2.1	1.3	1.9	7.5	25.9	4.8	1.4	0.8	4.3	6.6	2.8	2.5
Jeedipally	1.9	0.9	2.1	5.3	2.1	1.3	1.8	6.4	29.3	4.6	1.8	1.0	4.1	10.0	2.4	1.9
Lingareddipet	2.4	1.0	2.7	9.4	2.4	1.6	2.3	10.2	30.0	3.4	2.1	1.1	3.8	8.6	3.3	3.1
Medak	2.2	1.0	2.7	7.3	2.2	1.4	2.0	8.1	28.4	4.3	1.8	0.9	4.1	8.3	2.8	2.5
Gantlavelli	1.5	0.6	2.0	8.1	2.4	0.7	1.8	10.2	10.4	1.8	1.9	0.2	3.0	4.1	2.4	1.8
Mogalagidda	1.2	0.6	2.8	10.0	2.8	1.3	2.0	10.6	10.8	0.7	1.7	0.7	8.4	17.0	3.5	2.0
Bhemaram	1.3	0.4	1.5	7.5	2.0	1.6	1.3	12.9	3.5	0.2	1.2	0.7	2.5	13.0	1.9	2.7
Chattanpalle	1.2	0.3	1.0	8.9	2.4	1.6	0.8	15.0	12.0	0.3	1.5	0.8	2.2	14.8	1.2	1.7
Rangareddy	1.3	0.5	1.9	8.7	2.4	1.3	1.5	12.1	9.2	0.8	1.6	0.6	4.2	12.4	2.3	2.1
Chegunta	2.6	1.7	3.6	12.0	5.2	2.7	3.7	17.6	1.2	0.6	4.5	1.0	5.8	15.6	3.5	1.3
Gajulapeta	2.0	0.9	2.1	5.6	2.3	1.2	1.4	9.2	17.8	0.9	1.7	0.5	3.6	6.4	2.7	1.2
Mudumal	3.3	1.7	2.2	15.0	3.8	1.9	2.8	14.5	10.6	0.8	3.7	1.0	3.1	21.6	2.5	0.9
Kotakadira	2.3	1.4	2.7	9.5	3.3	1.0	2.6	12.0	27.8	2.9	2.3	0.4	3.5	6.5	2.6	1.6
Zainallpur	1.9	0.9	2.4	5.4	2.5	1.7	1.8	7.7	19.1	0.7	1.3	0.7	3.6	6.7	2.9	2.1
Mahabubnagar	2.4	1.3	2.6	9.2	3.4	1.7	2.4	11.9	15.4	1.1	2.6	0.7	3.9	11.0	2.9	1.4
Total	1.9	0.9	2.3	8.5	2.7	1.5	2.0	11.1	16.0	1.7	2.0	0.7	4.1	10.9	2.6	2.0

Note: M= Male; W= Women; * Post-harvest tasks include threshing, cleaning, drying, parboiling, husking, sorting, grading, packing, transporting, and storage work.

Table A18. Descriptive Statistics of Yield Rates of Paddy in the Sample Villages

Village	Mean	Median	Maximum	Minimum	Mode	SD
Kallakal	17.3	20.0	22.7	8.0	20.0	3.9
Jeedipally	16.7	18.0	25.0	0.7	20.0	5.5
Lingareddipet	15.9	16.0	22.5	0.4	20.0	4.8
Medak	16.6	18.0	25.0	0.4	20.0	4.8
Bhemaram	14.4	15.0	22.5	4.7	20.0	5.5
Chattanpalle	14.3	15.0	25.0	4.0	10.0	6.7
Gantlavelli	17.5	18.0	28.0	5.3	20.0	5.2
Mogalagidda	17.0	16.7	28.0	3.0	20.0	5.9
Rangareddy	16.3	16.7	28.0	3.0	20	5.8
Chegunta	15.6	15.6	15.6	15.6	15.6	0
Gajulapeta	16.7	17.5	26.7	5.0	17.5	6.7
Kotakadira	15.7	17.6	24.0	4.0	17.5	6.1
Mudumal	18.2	19.5	26.3	6.7	21.0	4.9
Zainallpur	14.8	15.0	27.5	5.9	7.5	5.9
Mahabubnagar	16.2	17.5	27.5	4.0	17.5	5.9
All	16.4	17.5	28.0	0.4	20.0	5.5

Table A19. Descriptive Statistics of Yield Rates of Cotton in the Sample Villages

Village	Mean	Median	Maximum	Minimum	Mode	SD
Kallakal	7	7	15	3	10	3
Jeedipally	6	6	8	4	4	1
Lingareddipet	7	7	13	2	7	3
Medak	7	7	7	7	7	.
Bhemaram	7	7	15	2	10	3
Chattanpalle	10	10	10	10	10	.
Gantlavelli	10	10	10	10	10	.
Mogalagidda	6	6	10	3	5	2
Rangareddy	7	7	10	3	3	5
Chegunta	8	8	13	5	5	3
Gajulapeta	7	7	13	3	5	2
Kotakadira	7	7	15	2	10	3
Mudumal	7	7	15	3	10	3
Zainallpur	6	6	8	4	4	1
Mahabubnagar	7	7	13	2	7	3
All	7	7	7	7	7	.

Table A20. Descriptive Statistics of Yield Rates of Red Gram in the Sample Villages

Village	Mean	Median	Maximum	Minimum	Mode	SD
Kallakal	7	5	15	3	3	5
Jeedipally	7	7	7	7	7	0
Lingareddipet	6	6	8	4	4	2
Medak	7	6	15	3	4	4
Bhemaram	4	4	5	3	3	1
Chattanpalle	5	4	8	4	4	2
Gantlavelli	7	7	8	6	6	1
Mogalagidda	5	5	8	3	4	2
Rangareddy	4	5	6	1	5	2
Chegunta	5	3	10	2	3	2
Gajulapeta	4	3	7	1	3	2
Kotakadira	4	4	5	3	3	1
Mudumal	4	4	7	3	3	2
Zainallpur	4	4	10	1	3	2
Mahabubnagar	5	4	15	1	3	3
All	7	5	15	3	3	5

Table A21. Descriptive Statistics of Yield Rates of Jowar in the Sample Villages

Village	Mean	Median	Maximum	Minimum	Mode	SD
Kallakal	6	5	9	3	5	2
Jeedipally	5	5	7	3	4	2
Lingareddipet	6	6	11	3	5	2
Medak	6	5	11	3	5	2
Bhemaram	4	4	5	4	4	1
Chattanpalle	5	5	6	4	6	1
Gantlavelli	6	6	10	2	6	2
Mogalagidda	6	6	8	3	5	1
Rangareddy	6	6	10	2	4	2
Chegunta	3	3	3	3	3	0
Gajulapeta	2	2	5	1	2	1
Kotakadira	4	4	5	3	3	1
Mudumal	4	4	6	1	5	1
Zainallpur	4	4	6	1	5	1
Mahabubnagar	5	5	11	1	5	2
All	6	5	9	3	5	2

Table A22. Descriptive Statistics of Yield Rates of Maize in the Sample Villages

Village	Mean	Median	Maximum	Minimum	Mode	SD
Kallakal	12	12	13	10	10	2
Jeedipally	10	10	10	9	9	1
Medak	11	10	13	9	10	2
Gantlavelli	10	11	15	3	10	3
Rangareddy	10	11	15	3	10	3
Zainallpur	17	17	17	17	17	5.9
Mahabubnagar	17	17	17	17	17	5.9
All	11	10	17	3	10	3

Table A 23. Regression Estimates for Paddy Crop

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.257	2.335		3.965	0.000
	Farm Size	0.022	0.183	0.008	0.122	0.903
	fertilizers	0.567	0.609	0.059	0.931	0.353
	Labor	0.107	0.048	0.143	2.246	0.026
	Manure	-0.008	0.026	-0.021	-0.319	0.750
	Pesticides kg	-0.887	1.517	-0.037	-0.584	0.559
	Pesticides ltrs	0.130	0.845	0.010	0.153	0.878
	Irrigation dummy	2.345	1.335	0.116	1.756	0.080
	Village Dummy	0.055	0.045	0.086	1.229	0.220
2	(Constant)	9.263	2.329		3.977	0.000
	fertilizers	0.563	0.607	0.058	0.929	0.354
	Labor	0.107	0.048	0.143	2.248	0.025
	Manure	-0.009	0.026	-0.021	-0.330	0.741
	Pesticides kg	-0.890	1.514	-0.037	-0.588	0.557
	Pesticides ltrs	0.131	0.843	0.010	0.156	0.876
	Irrigation dummy	2.376	1.308	0.118	1.816	0.071
	Village Dummy	0.057	0.042	0.089	1.380	0.169
3	(Constant)	9.317	2.299		4.052	0.000
	fertilizers	0.560	0.605	0.058	0.926	0.356
	Labor days	0.107	0.048	0.143	2.250	0.025
	Manure	-0.008	0.026	-0.020	-0.317	0.752
	Pesticides kg	-0.908	1.506	-0.038	-0.603	0.547
	Irrigation dummy	2.365	1.304	0.117	1.814	0.071
	Village Dummy	0.058	0.041	0.090	1.402	0.162
4	(Constant)	9.262	2.289		4.047	0.000
	fertilizers	0.557	0.604	0.058	0.922	0.357
	Labor days	0.109	0.047	0.145	2.299	0.022
	Pesticides kg	-0.938	1.500	-0.039	-0.625	0.532
	Irrigation dummy	2.300	1.285	0.114	1.790	0.075
	Village Dummy	0.058	0.041	0.090	1.410	0.160

	Model Summary(b)					
	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
	1	0.203	0.041	0.010	5.439	1.794
	2	0.203	0.041	0.014	5.428	
	3	0.202	0.041	0.018	5.417	
	4	0.201	0.041	0.021	5.407	

Table A 24. Regression Estimates for Cotton Crop

Coefficients(a)								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.052	1.741		2.327	0.023		
	Irrigation dummy	0.704	0.771	0.100	0.912	0.365	0.928	1.077
	Farm Size	-0.167	0.069	-0.300	-2.414	0.018	0.717	1.395
	Manure	0.004	0.017	0.027	0.250	0.803	0.936	1.068
	Labor	0.018	0.033	0.067	0.554	0.581	0.763	1.311
	Fertilizers	0.657	0.455	0.163	1.444	0.153	0.875	1.143
	Pesticides (kg)	2.493	0.957	0.315	2.604	0.011	0.760	1.315
	Pesticides (L)	0.761	0.508	0.168	1.498	0.139	0.884	1.131
	Village_Code	0.854	0.934	0.121	0.915	0.363	0.633	1.579
	District_Code	-0.315	0.395	-0.112	-0.798	0.428	0.567	1.762
2	(Constant)	4.086	1.725		2.368	0.020		
	Crop_irrigation	0.692	0.765	0.098	0.904	0.369	0.932	1.073
	Farm size	-0.168	0.068	-0.303	-2.465	0.016	0.724	1.382
	Labor	0.019	0.032	0.070	0.587	0.559	0.771	1.297
	Fertilizers	0.641	0.448	0.159	1.432	0.156	0.893	1.120
	Pesticides (kg)	2.480	0.950	0.313	2.610	0.011	0.763	1.311
	Pesticides (L)	0.768	0.504	0.169	1.522	0.132	0.887	1.128
	Village_code	0.840	0.926	0.119	0.906	0.368	0.636	1.573
	District_code	-0.311	0.393	-0.110	-0.793	0.430	0.568	1.760
3	(Constant)	4.739	1.313		3.609	0.001		
	Irrigation dummy	0.669	0.761	0.095	0.880	0.382	0.934	1.071
	Farm size	-0.161	0.067	-0.290	-2.408	0.018	0.751	1.331
	Fertilizers	0.683	0.440	0.169	1.555	0.124	0.917	1.090
	Pesticides (kg)	2.531	0.942	0.319	2.687	0.009	0.769	1.300
	Pesticides (L)	0.814	0.496	0.180	1.642	0.105	0.909	1.100
	Village_code	0.896	0.917	0.127	0.977	0.332	0.643	1.556
	District_code	-0.380	0.373	-0.134	-1.017	0.312	0.623	1.605
4	(Constant)	4.631	1.305		3.547	0.001		
	Farm size	-0.159	0.067	-0.287	-2.392	0.019	0.752	1.330
	Fertilizers	0.731	0.436	0.181	1.677	0.098	0.931	1.074
	Pesticides (kg)	2.462	0.937	0.311	2.626	0.010	0.774	1.291
	Pesticides (L)	0.788	0.494	0.174	1.595	0.115	0.913	1.096
	Village_code	1.068	0.895	0.151	1.193	0.236	0.673	1.485
	District_code	-0.418	0.370	-0.148	-1.129	0.262	0.632	1.583
5	(Constant)	4.600	1.307		3.519	0.001		
	Farm size	-0.143	0.065	-0.258	-2.194	0.031	0.789	1.267
	Fertilizers	0.685	0.435	0.170	1.575	0.119	0.939	1.065
	Pesticides (kg)	2.533	0.937	0.320	2.704	0.008	0.778	1.285
	Pesticides (L)	0.787	0.495	0.173	1.589	0.116	0.913	1.096
	Village_code	0.531	0.759	0.075	0.699	0.487	0.939	1.065
6	(Constant)	5.144	1.047		4.912	0.000		
	Farm size	-0.152	0.063	-0.274	-2.397	0.019	0.825	1.213
	Fertilizers	0.721	0.430	0.178	1.676	0.098	0.953	1.050
	Pesticides (kg)	2.563	0.933	0.324	2.748	0.007	0.780	1.283
	Fertilizers (L)	0.829	0.490	0.183	1.691	0.095	0.926	1.080

a	Dependent Variable: Cotton yield Model Summary(b)					
	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
	1	0.422	0.178	0.078	2.464	2.119
	2	0.421	0.177	0.090	2.448	
	3	0.417	0.174	0.098	2.437	
	4	0.407	0.165	0.100	2.434	
	5	0.389	0.151	0.097	2.438	
	6	0.382	0.146	0.103	2.430	

Table A 25. Regression Estimates for Red Gram Crop

Coefficients(a)								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.883	1.283		2.247	0.029		
	Farm Size	-0.231	0.202	-0.146	-1.143	0.258	0.847	1.181
	Fertilizers	0.381	0.350	0.130	1.089	0.281	0.979	1.022
	Pesticides (L)	1.199	0.806	0.199	1.487	0.143	0.774	1.292
	Pesticides (kg)	-1.750	1.423	-0.164	-1.230	0.224	0.783	1.276
	Irrigation dummy	-1.821	0.760	-0.304	-2.395	0.020	0.862	1.160
	District_code	1.022	0.463	0.286	2.209	0.032	0.830	1.205
2	(Constant)	3.549	1.129		3.143	0.003		
	Farm size	-0.253	0.202	-0.160	-1.256	0.215	0.855	1.169
	Pesticides (L)	1.226	0.807	0.204	1.519	0.135	0.775	1.291
	Pesticides (kg)	-1.585	1.417	-0.148	-1.118	0.268	0.793	1.262
	Irrigation dummy	-1.833	0.761	-0.306	-2.407	0.020	0.863	1.159
	District_code	1.031	0.463	0.288	2.226	0.030	0.830	1.205
3	(Constant)	3.138	1.070		2.932	0.005		
	Farm size	-0.286	0.200	-0.181	-1.433	0.157	0.874	1.144
	Pesticides (L)	1.572	0.747	0.261	2.104	0.040	0.908	1.101
	Irrigation dummy	-1.761	0.760	-0.294	-2.316	0.024	0.869	1.151
	District_code	1.054	0.464	0.295	2.271	0.027	0.832	1.202
a	Dependent Variable: Yield							

Model Summary(b)								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin - Watson			
1	0.514	0.264	0.181	2.253	2.211			
2	0.498	0.248	0.178	2.257				
3	0.480	0.230	0.174	2.262				

Table A26. Cropwise Yields (Value and Cost of Cultivation with Different Indicators of Sample Households by Economic Groups)

Crop: a (paddy)

Village	MF				SF				Medium				Large				All			
	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield
Kallakal	23890	18266	5624	18	30586	22439	8148	16	26383	20794	5589	15					26006	19642	6364	18
Jeedipally	24895	19548	5347	17	19071	16112	2959	12	27750	21743	6008	20					24199	19162	5037	17
Lingareddipet	25421	22972	2449	15	32487	25258	7229	19	35331	24658	10673	19					27205	23417	3788	16
Medak	24861	20581	4280	17	27964	21482	6482	16	31199	22963	8236	19					25836	20900	4936	17
Gantlavelli	20713	22162	-1449	15	21725	15194	6531	19	12702	10433	2269	19	25200	21400	3800	21	20090	17926	2164	18
Mogalagidda	20021	19959	62	15	25932	25753	179	18	29839	23601	6238	21	29787	18081	11706	18	23482	21667	1815	17
Bhemaram	16799	19200	-2401	13	16883	11746	5137	12	25179	15465	9714	17	20854	13995	6859	18	19376	15817	3559	14
Chattanpalle	21800	14993	6807	10	16243	13271	2972	16	25158	24021	1137	13					19414	16711	2703	14
Rangareddy	19721	20369	-648	14	19836	15944	3892	17	23831	19156	4675	18	24174	16868	7306	19	20884	18454	2430	16
Chegunta			0		26667	18560	8107	16			0						26667	18560	8107	16
Gajulapeta	22556	10097	12459	17	20130	15484	4646	17	17325	13914	3411	15					19502	14651	4851	17
Mudumal	16565	14836	1729	14	30366	19093	11273	18	30544	23928	6616	21	30625	20931	9694	19	28464	19997	8467	18
Kotakadira	24713	21310	3403	17	24721	14455	10266	16	21141	9714	11427	14	24705	14538	10167	13	24036	14866	9170	16
Zainallpur			0		22259	17089	5170	14	27500	10419	17081	21	27152	15146	12006	13	23762	16033	7729	15
Mahabubnagar	22077	17859	4218	17	24232	16291	7941	16	23349	15434	7915	17	26868	16060	10808	14	24009	16269	7740	16
Total	22883	20271	2612	16	23414	17019	6395	17	24580	18086	6494	18	25670	16419	9251	17	23488	18550	4938	16

Maximum marginal farmers are not sold the crop they kept for food.

Crop: b (cotton)

Village	MF				SF				Medium				Large				All			
	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield
Kallakal																				
Jeedipally																				
Lingareddipet									32214	24798	7416	10.0					32214	24798	7416	10.0
Medak									32214	24798	7416	10.0					32214	24798	7416	10.0
Gantlavelli											0									
Mogalagidda	33971	26753	7218	8.6	30796	28499	2297	5.1	39700	34813	4887	8.8	37100	30556	6544	9.9	33897	28653	5244	7.6
Bhemaram	31121	25551	5570	5.7	34792	29788	5004	6.9	39438	36529	2909	7.2	40685	35198	5487	5.0	35641	32427	3214	6.3
Chattanpalle			0		36667	30988	5679	6.5									36667	30988	5679	6.5
Rangareddy	32546	26152	6394	7.1	33877	31872	2005	6.2	39503	36100	3403	7.6	39490	33650	5840	6.6	35073	30892	4181	6.8
Chegunta	35485	27804	7681	7.5	32000	24074	7926	10.0	37297	27565	9732	7.2	37624	26161	11463	6.2	36933	26948	9985	7.1
Gajulapeta	30000	25690	4310	5.3	30533	28425	2108	6.5	36083	25395	10688	7.0			0		32206	27392	4814	6.3
Mudumal	30245	26290	3955	4.7	34570	26732	7838	8.6	37063	34811	2252	6.5	35625	26681	8944	6.3	34865	30108	4757	6.9
Kotakadira											0									
Zainallpur									33727	28018	5709	7.3					33727	28018	5709	7.3
Mahabubnagar	31494	26518	4976	5.6	33369	27041	6328	8.5	37027	29609	7418	7.0	37424	26213	11211	6.2	35662	28136	7526	6.9
All	32020	26335	5685	6.3	33597	27937	5660	7.5	37172	30214	6958	7.2	37901	27929	9972	6.3	35453	28579	6874	6.9

Crop: c (red gram)

Village	MF				SF				Medium				Large				All			
	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield	Output Value	Input Costs	Net Income	Yield
Kallakal	21010	18645	2365	6					21622	18300	3322	5					2112	18588	4071	6
Jeedipally	21625	17767	3858	7							0						21625	17767	3858	7
Lingareddipet	22622	18160	4462	6					22511	19321	3190	6					22585	18547	4038	6
Medak	20394	18342	2052	7					22066	18811	3255	5					20698	18427	2271	7
Gantlavelli											0									
Mogalagidda	17323	13031	4292	3	20833	13567	7266	5			0						19078	13299	5779	4
Bhemaram					20412	13033	7379	6			0		24338	16825	7513	4	21721	14297	7424	5
Chattanpalle					22651	15550	7101	6	21000	14308	6692	6			0		21825	14929	6896	6
Rangareddy	17323	13031	4292	3	21077	13796	7281	6	21000	14308	6692	6	24338	16825	7513	4	20996	14192	6804	5
Chegunta							0		19213	18994	219	3	27485	19790	7695	5	22659	19326	3333	4
Gajulapeta	23974	14250	9724	6	22225	18854	3371	4	19500	17567	1933	3					22419	17693	4726	5
Mudumal	19231	13374	5857	6	20023	15576	4447	3	20992	17879	3113	3					20073	15605	4468	4
Kotakadira					23639	14006	9633	4	20714	14161	6553	3					22908	14045	8863	4
Zainallpur	20100	15520	4580	3	22989	17983	5006	5	21538	15175	6363	3					22266	17104	5162	4
Mahabubnagar	21747	14170	7577	6	22261	17388	4873	4	19852	17968	1884	3	27485	19790	7695	5	22121	17380	4741	4
Total	20709	16446	4263	6	22056	16763	5293	4	20224	17837	2387	4	26960	19296	7664	5	21729	17200	4529	5

Crop: d (Jowar)

Village	MF				SF				Medium				Large				All			
	GVO	IC	NI	Yi	GVO	IC	NI	Yi	GVO	IC	NI	Yi	GVO	IC	NI	Yi	GVO	IC	NI	Yi
Kallakal	13365	10614	2751	6	12125	11779	346	5	11780	9660	2120	5					12125	11779	346	6
Jeedipally	13783	12589	1194	5			0												0	5
Lingareddipet	12039	10685	1354	6	12650	9992	2658	6	10511	9512	999	5					12650	9992	2658	6
Medak	13148	11257	1891	6	12335	11064	1271	5	11357	9611	1746	5					12335	11064	1271	6
Gantlavelli	11700	8575	3125	4	12500	7113	5387	5			0		11250	9120	2130	4	12500	7113	5387	4
Mogalagidda	12237	9688	2549	5	11429	8100	3329	5	12120	9450	2670	4	11840	9630	2210	6	11429	8100	3329	5
Bhemaram	10982	11336	-354	6	10746	12336	-1590	6	11192	11992	-800	6	12069	8161	3908	5	10746	12336	-1590	6
Chattanpalle	11895	8228	3667	5	12914	10272	2642	6	11109	11387	-278	6	12773	10998	1775	6	12914	10272	2642	6
Rangareddy	11581	9828	1753	5	11966	10779	1187	6	11252	11496	-244	6	12129	9511	2618	5	11966	10779	1187	6
Chegunta			0				0		11850	9065	2785	3	12273	10082	2191	3			0	3
Gajulapeta			0		10713	11429	-716	2									10713	11429	-716	2
Mudumal			0				0												0	
Kotakadira			0		9150	12588	-3438	4									9150	12588	-3438	4
Zainallpur	11536	9030	2506	4	12855	10776	2079	4	10444	9711	733	3	14550	10692	3858	5	12855	10776	2079	4
Mahabubnagar	11536	9030	2506	4	11911	11116	795	4	10678	9603	1075	3	13411	10387	3024	4	11911	11116	795	4
Total	12430	10569	1861	6	11974	10987	987	5	11087	10600	487	5	12449	9730	2719	5	11974	10987	987	5

Questionnaire

Accelerating Farm Incomes (AFI): Building Sustainable Soil Health, Markets and Productivity in Telangana State, India

Funded by: Walmart Foundation

Implemented by: International Fertilizer Development Center (IFDC)

Baseline Survey of Sample Households in AFI Project Area

Questionnaire No. _____

Time of Interview Start: _____ Date of Interview _____/_____/_____
dd mm yy

Interviewer's Name: _____

A. Name of the Farmer and Farm Location

A1. Farmer's Name_____ A2. Father's Name _____

A3. Village _____ A4. Mandal _____

A5. District _____ A6. Cell Phone: | | | | | | | | | | |

B. Information about the Household

B1. Total members in household: _____

B2. **Household Composition, Education and Employment**

Relationship to Farmer (**Code**)	*Gender (M=1; F=2)*	*Age*	Education (years)	Marital Status (Married=1; Single=2; Widow=3)	Provides Labor **On-Farm** (Y=1, N=2)	Involved in **Off-Farm** Employment (Y=1, N=2)	Type of **activity** (Dairying=1; Sheep/Goat rearing=2; Poultry=3; Other=4 (specify):	**Non-Farm Employment**		
								Y=1; N=2	Months Per Year	Type of Occupation (Service=1; Business=2; Other=3 (specify):
Head										

Relationship with the Head (Code)*: Head=1, Spouse of Head=2, Son=3,Daughter=4,father, Mother=6,Other=7 (specify):*

M= Male; F= Female; Y= Yes; N= No.

B3. Please provide information of your household income by source

Income Source	Rupees (Annual)
Farming (Crops)	
Farming (Livestock)	
Farming (Poultry)	
Farming (Fisheries)	
Business	
Salary/Wages	
Rental of land or property	
Pension	
Remittance	
Assistance of relatives	
Govt. Welfare Programs	
Other (Specify)	

B4. What type of family is in the household (**please**√)? B4.1 Joint ☐ B4.2 Single ☐

B5. What is the distance from the house to a paved road? (Kms.): _____

B6. What is the distance from the house to the nearest agriculture inputs market? (Kms.): _____

B6.1. What is the distance from the house to the nearest agriculture output market? (Kms.): _____

C. <u>Farm Size, Land Tenure, and Crop Production</u>

C1. Please describe your household land ownership (in acres):

C1.1. Cultivable Land: _____ C1.2. Homestead Area: _____C1.3. Fallow Land _____

C1.4. Lease-Out Area _____C1.5. Fish Pond Area _____C1.6. Homestead Forest Area: _____

C2. What was your total net cultivated area in 2018-19 (Acres)? _____

C2.1. Irrigated Area: _____ C2.2 Source of Irrigation= (1= canal; 2= Tank; 3= Groundwater (Dugwell, Shallow Tube Well, Deep Tubewell); 4= Lift Irrigation; 5= Other Sources (specify) :)

C3. Among it, what area (Acres): C3.1 Owned (irrigated: _____; Un-irrigated: _____)

C3.2. Leased-in (irrigated: _____; Un-irrigated: _____)

C3.3. Shared Cropped (irrigated: _____; Un-irrigated: _____)

C3.4. Area under 1. Single crops: _____; 2. Double/Inter crops: _____

C4. Have you ever tested your soil for crop production (**please√**)? Yes ☐ No ☐

C4.1. ***If No***, why? ----------

C4.2. ***If Yes***, do you follow the fertilizer use recommendation based on your soil test (**please√**)? Yes ☐ No ☐

C5. Do you use Poly House for crop production (**please√**)? Yes ☐ No ☐

C5.1 If Yes, what was the area cultivated under Poly House (Acres)? _____

C6. Please provide information on your crop production that was harvested in 2018-19

Crop*	**Season (Kharif= 1; Rabi=2; Summer=3)**	**Irrigation (Y=1; N=2)**	**Cultivated Area (Acres)**	**Total Production (Qtls.)**

**Please list all crops cultivated by the household in 2018-19*

D. Methods of Land Preparation

D1. **Please provide information on method of land preparation for crop production in 2018-19**.

Method	Area (Acres)			No. of Ploughings			Hired/Owned (1=Hired; 2=Owned)			Total Rental Cost Human, Animal and Machines (in Rs.)		
	K	R	S	K	R	S	K	R	S	K	R	S
Manually operations (By hand: spade, hand plough, etc.)												
Animal												
Machine												

K= Kharif; R= Rabi; S=Summer

E. Planting Method

E1. Please provide information on Planting Method you practiced for crop production in 2018-19

Crop	Season (K=1; R=2 S=3)	Area	Irrigation (Y=1; N=2)	In Line	Random	Direct Seeding	Transplanting
				(please √)			

F. Use of Fertilizer, Seed, Irrigation, and Crop Protection Products

F1. Please provide information on use of Chemical Fertilizer for crop production in 2018-19

Crop	S	I	Fertilizer Products Purchased									
			Urea		DAP		SSP		Potash		Complex (NPK)	
			Qty. (Qtls.)	Cost (Rs.)	Qty. (Qtls.)	Cost (Rs.)	Qty. (Qtls.)	Cost (Rs.)	Qty. (Qtls.)	Cost (Rs.)	Qty. (Qtls.)	Cost (Rs.)

Note: S= Season: Kharif=1; Rabi=2; Summer=3; I= Irrigated: Yes=1; N=2

F2. What is your source of fertilizer purchase (**please√**)? F2.1 Marchant ☐ F2.2 Dealer ☐

F2.3 Local Fertilizer Shops ☐ F2.4 Other (specify): _____

F3. How do you purchase fertilizer (**please√**)? F3.1 Cash ☐ F3.2 Credit ☐ F3.3 Other _____

F4. Do you use any micronutrient fertilizers in your crop production (**please√**): Yes ☐ No ☐

F4.1 If Yes. Please provide details (provide names and Quantities):

F5. What is your source of seed (**please√**)? F5.1 Own saved seed ☐ F5.2 Purchased ☐ F5.3 Other___

F6. Please provide information on <u>seed/seedling</u> for crop production in 2018-19

Crop	**S**	**I**	**Seed Variety**						**Purchase of Seedling**		**Cost on Seed/seedling treatment (Rs.)**
			HYV		**Hybrid**		**Local**		Total Cost (Rs.)	**Variety** (Local=1; Improved=2 ; Hybrid=3)	
			Qty. (Kg.)	Cost (Rs.)	Qty. (Kg)	Cost (Rs.)	Qty. (Kg.)	Cost (Rs.)			

Note: S= Season: Kharif=1; Rabi=2; Summer=3; **I**= Irrigated: Yes=1; N=2

F7. Do you follow integrated pest management (IPM) practices in crop management (**please√**)? Yes ☐ No ☐

F7.1 If no, why? ----------

F8. **Please provide information on the use of <u>Organic/Natural Fertilizers</u> for crop production in 2018-19**

Crop	S	I	Organic Fertilizer Quantity in Qtls. and Cost in Rs.												
			Animal Manure		Green Manure		Vermi-compost		Residue Retention (Straw)		Biochar		Other (Specify)		
			Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Name	Qty	Cost

Note: **S=** Season: Kharif=1; Rabi=2; Summer=3; **I=** Irrigated: Yes=1; N=2

F9.What is your source and method of irrigation (**please**√)? F9.1 Canal ☐ F9.2 STW ☐
F9.3 DTW☐ F9.4 LLP (Lift Irrigation) ☐F9.5 Indigenous (local streams, ponds etc.,) ☐
F9.6 Micro-Irrigation (Drip, sprinkler irrigation) ☐

F10. Please provide information on <u>irrigation</u> for crop production in 2018-19?

Crop	Season (Code)	Area (Acres)	Source (code)	No. of Irrigations	Method of irrigation (1=Flooding; 2= Drip; 3= Sprinkler)	Total Cost of Irrigation (Rs.)*

Note: Season (Code): Kharif=1; Rabi=2; Summer=3; Source code: 1= Canal; 2=Tank; 2= Shallow Tube Well; 3= Deep Tube Well; 4= LLP (Lift Irrigation from local streams, ponds etc.,)

** If the cost of irrigation paid in kind then please convert it to Rs.*

G. Pests and Diseases Attack

G1. Did your crop affect by pests or diseases in 2018 (**please√**)? Yes ☐ No ☐

G2. If Yes, please provide the following information

Crop	S	I	Name of Pests (Insects)	Name of Diseases	Level of Infestation (*please √*)		
					Slight=1	Bad=2	Very Bad=3

Note: S=Season: Kharif=1; Rabi=2; Summer=3; I= Irrigated: Yes=1; N=2

G3. Please provide information on the use of <u>Chemical and Organic Pesticides</u> for crop protection in 2018-19

Crop	S	I	Pesticide Products Purchased											
			Chemical Based (used Pesticides Method/Practice)						Organic Farming /Natural Farming/Practice					
			Crop 1 (……)		Crop 2 (……)		Crop 3 (……)		Crop 1 (……)		Crop2 (……..)		Crop3 (……...)	
			Qty. (Kg /Lts)	Cost (Rs.)	Qty. (Kg /Lts)	Cost (Rs.)	Qty. (Kg /Lts)	Cost (Rs.)	Qty (Kg /Lts)	Cost (Rs.)	Qty. (Kg /Lts)	Cost (Rs.)	Qty. (Kg /Lts)	Cost (Rs.)

Note: **S=**Season: Kharif=1; Rabi=2; Summer; **I=** Irrigated: Yes=1; N=2
Please provide the names in brackets while entering; Kg= Kilograms; L= Liters

H. <u>Inter-Culture Operation</u>

H1. What are the inter-culture operations you follow for your crop production (**please√**)?

H1.1. Watering ☐ H1.2. Earthen up ☐ H1.3. Weeding ☐ H1.4. Mulching ☐

H1.5. Pest and Disease Management ☐ H1.6. Fertilizer Top Dressing ☐

J. <u>Use of Agricultural Credit</u>

J1. Have you received any credit or loan for agricultural production in 2018-19 **(please√**)? Yes ☐ No ☐

J2. ***If Yes***, please provide the following information.

Source of Credit	Loan Amount (in Rs.)	Loan Period (Months)	Annual Interest Rate (%)	Loan outstanding (in Rs.)

K. <u>Agriculture Advisory Support</u>

K1. Do you receive any technical advisory support for crop production (**please √**)? Yes ☐ No ☐

K2. If **Yes**, please mention the source of advisory support: _____

L. <u>Animal Ownership</u>

L1. Please provide the information on <u>Animal Ownership</u> in 2018-19

Type of Animal	*Number*	*Present Value (in Rs.)*	*Type of Animal (Young Stock)*	*Number*	*Present Value (in Rs.)*
Cows			Lambs		
Goats			Ducks		
Chickens			Other (specify):		
Bullocks			Other (specify):		
Buffaloes			Other (specify):		

M. Ownership of Agricultural Equipment and Household Furnishings

M1. Please provide your Household Ownership of Agricultural Equipment and furnishing in 2018-19

Agricultural Equipment	Number	Present value (in Rs.)	Household Furnishings	Number	Present value (in Rs.)
Power Tiller			Radio		
Tractor			Television		
Deep Tubewell (DTW)			Automobile		
Shallow Tubewell (STW)			Motorcycle		
Low Lift Pumps (Diesel/electrical)			Bicycle		
Sprayer (hand/power)			Sewing machine		
Weedier			Refrigerator		
Power Thresher			Table		
Paddle Thresher			Chair		
Transplanter			Cell Phone		
Drier			Other (specify):		
Harvester			Other (specify):		
Other (specify):			Other (specify):		
Other (specify):			Other (specify):		

N. Housing Characteristics

N1. In what type of house, the household members reside (**please √**)?

N1.1. Straw ☐ N1.2. Mud ☐ N1.3. Tin ☐ N1.4. Cement ☐ N1.5. Bamboo ☐

N2. Do you have electricity in your house (**please√**)? Yes ☐ No ☐

N3. What is the source of drinking water (**please√**)? N3.1. GP/Municipality Supply ☐
N3.2. RO Plant with in the Village ☐ N3.3.Supplied Protected water outside the village ☐
N3.4. Hand Pump/Tubewell (HTW) ☐ N 3.5. Shallow Tubewell (STW) ☐
N3.6. Deep Tubewell (DTW) ☐ N 3.7. Dugwell ☐ N 3.8. Pond/stream ☐ N 3.9. River ☐

N4. What is the present value of the House (in Rs.): _____

O. Sale of Farm Products

O1. Please provide the information on income from agriculture product sales in 2018-19

Type of Product Sold*	Quantity Sold		Total Income Received (in Rs.)	Distance to Market (Kms.)	Agency sold to
	(Qtls.)	(Number)			

***** *include crops, livestock and fisheries*

O2. What is your source of information related to marketing of your products (***please √***)?

O2.1. Community group ☐ O2.2. Neighbor ☐ O2.3. Retailer ☐ O2.4. Wholesaler ☐

O2.5. Cell Phone ☐ O2.6. Apps based agro-service/Call center ☐
O2.7. Other (specify): _____

O3. Whom do you sell your products (**please √**)? O3.1 Middle-man/Agent ☐ O3.2 Retailer ☐

O3.3 Wholesaler ☐ O3.4 Regulated Markets (APMCs) ☐ O3.5 Rythu Bazars ☐

O3.6 selling directly to the consumer's ☐ O3.7. Other ☐

(***specify***):_____

O4. When do you sell your crops (***please √***)? O4.1 Just after harvest ☐ O4.3 After processing ☐

O4.4 When price high ☐ O4.5 When money needed ☐

P. Community Approach

P1. Is there any Farmer Group/Club in your village (***please √***)? Yes ☐ No ☐

P2. ***If Yes***, please mention the name of that group _____

P3. Are you a member of that group (***please √***)? Yes ☐ No ☐

Q. Nutrition and Hygiene

Q1. Do you have any knowledge on nutrition in food which you are taking in your family?
Yes ☐ No ☐, If Yes, source of information: _____

Q2. Please provide the following information on **food items which your family consuming** per week.

Q2.1 Meat (kg.):_____; Q2.2. Fish (kg.):_____;Q2.3.Egg (Number):_____; Q2.4 Pulses (kg.):_____ Q2.5. Milk (Liter):_____; Q2.5. Vegetable (kg.):_____; Q2.6. Fruits (kg.):_____

Q3. What do you use for hand washing in your household? _____

Q4. Is the toilet you use (**Please√**): private (one household), shared (more than one household) or public?

Q5. What kind of **Toilet** does your household use? Please explain: _____

R. Use of Household and Hired Labor

R1. What was the wage of labor/day/person (**in Rs.)** in 2018-19? R1.1. Man _____ R1.2. Woman _____

R2. Please provide the Labor Information for Crop that was harvested in 2018-19

Crop	Land Preparation		Seeding/ Transplanting		Fertilizer Application		Weeding		Irrigation		Pesticide		Harvesting		Post-Harvest Tasks*	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
	Household/Family Labor Days															
	Hired Labor Days															

**Post-harvest tasks include threshing, cleaning, drying, parboiling, husking, sorting, grading, packing, transporting, and storage work etc.,*

Note: **Labor Day:** 8 hours per day

Time of Interview End: _____ Data checking and verification by: _____ Date: _____/_____/____

(Name) dd mm yy


IFDC
Developing Agriculture from the Ground Up