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Research Article

Effect of Value Chain Development Programme on Small-Scale Rice Farmers in Niger State, Nigeria

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Abstract

This study examined the effect of the International Fund for Agricultural Development Value Chain Development Programme (IFAD-VCDP) on the small scale rice farmers' income in Niger State, Nigeria. Multistage random sampling technique was used to sample respondents. Three segments (Treatment, Spill-over and control group) from 18 villages and 36 farmers' cooperative groups were consided for the study. A total of 110 participants, 90 of spill-over groups and 95 of control groups were sampled. Data were analyzed using descriptive and inferential statistics. The result of socio-economic characteristics showed that an appreciable number of respondents were in their active and energetic age, male, married with moderate household size and had atleast one form of formal education. The cost and return analysis showed that rice production under the IFAD in the study area was profitable. It may be concluded that IFAD had impacted positively the income status of participating rice farmers in the study area. From this finding, it may be recommended that government at all levels and non-governmental organizations should ensure continuity and sustainability of the programme.

Keywords: *International fund, Value chain, Food security, Small-scale, Rice farmers*

Introduction

Agriculture is an important sector which brings about poverty reduction and economic development. It plays a significant role in livelihoods, employment, income, growth, food security, socio-economic development and environmental sustainability in developing countries (World Bank, 2008; Pingali, 2010; International Fund for Agricultural Development, IFAD, 2011; IFPRI, 2011). In Nigeria, the agricultural sector accounted for 24.4% of Gross Domestic Product (GDP) in 2016 (National Bureau of Statistics – NBS, 2016). Klynveld Peat Marwick Goerdeler (KPMG) International (2013) reported that an estimated one percent increase in crop yield will lead to 0.5 - 0.8 percent reduction in poverty. This is evident from the fact that Nigeria is world's number one producer of cassava, yam and cowpea; world's number two producers of sweet potato, cashew and Okra; and world's number four producer of sesame (SAHEL, 2017). This was made possible because the country has a cultivable land area of about 83 million hectares, out of which 30 to 34 million hectares are being cultivated (Ajayi, 2015). Notwithstanding, Nigeria's potential in respect to smallholder commercialization is largely untapped and the current status of agriculture in the country is a source of major concern (Awotide and Akerele, 2010; Jayne *et al.*, 2011).

In an effort to boost agricultural production of Nigerian farmers, the Federal Ministry of Agriculture and Rural Development (FMARD) (2016a) asserted that the country ought to partner with private

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investors across farmer groups and companies in order to develop and ensure an holistic value chain solutions. These chains will receive facilitated government support as they make deep commitments to engage new generation of farmers and esure improve the farm inputs supply. The overall purpose of this assertion is to ensure that farmers supply products that are more acceptable to consumers and generate more income. The Value Chain Development Programme (VCDP) constituted include the Agricultural Transformation Agenda (ATA) of the Federal Government of Nigeria. This programme used the advantage of the existing market opportunities to address the existing constraints along the value chain (FMARD, 2016b). In addition, it provided a solution to the poor performance of African Agriculture (Nigeria inclusive), which has been lagging behind in adapting the structural transformation of the International Agro-food Market. Similarly, in collaboration with the three tiers of government, the International Fund for Agricultural Development (IFAD) developed a six-year initiative plan for improving cassava and rice value chains of small-scale farmers in six states, namely: Anambra, Benue, Ebonyi, Niger, Ogun and Taraba. The IFAD projects are normally production oriented, and their main objective is to have a direct impact on the production levels of target groups, which in turn, expected to lead to increase in the net income of the farmers (IFAD, 2015). Rios *et al.* (2008) reported that the poorest people in the world are farmers with low agricultural productivity and low commercialization levels. The author was also opined that increasing either one could help to improve the other, and both could boost rural economies and living standards.

Despite several programmes aimed at addressing poverty in the country, especially at the rural level, poverty is still prevalent in the country (Ndanitsa, 2014). The failure of the previous interventions by the government was attributed to an inherent weakness in the strategy of increasing productivity of the small-scale farmers and non-cognisance of the role market has on the poor (Ndanitsa, 2014). Similarly, these programmes did not generate sustainable income for participating farmers which necessitate a shift from one intervention programme to another (Ndanitsa, 2014). Hence, this study is poised to find out whether the income generated by participating farmers under IFAD is productive, esuring savings, investment, guarantee sustainable livelihood and sustainability of the programme after its exit. The aim of the study is to determine the effect of IFAD Value Chain Development Programme on the poverty status and food security status of the small-scale rice farmers in Niger State of Nigeria.

Materials and Methods

The study area was Niger State in Nigeria. The state comprises of twenty-five (25) Local Government Areas (LGAs). The state is located between latitudes 8° 22′ N and 11° 30′ N and longitudes 3° 30′ E and 7° 20′ E. It has a total land area of 76,363 km², which represents about 10 percent of the total land area of Nigeria, and 85 percent of this landmass is arable (Niger State Bureau of Statistics - NBS, 2012). The state has an estimated human population of 3,950,249 (National Population Commission - NPC, 2006), which was projected to be about 5,016,816 in 2016 with an annual growth rate of 2.7 percent (NBS, 2016). Niger State experiences distinct dry and wet seasons with annual rainfall varying from 1,100mm in the Northern part to 1,600mm in the southern part of the state. Its maximum temperature is usually 37°C which is recorded between March and June, while the minimum is usually 21°C between December and January. Most of the communities in Niger State are predominantly agrarian who cultivate crops such as sugar cane, vegetables, groundnut, soya beans, rice, melon, cassava, sorghum, millet, shea butter, yam, cotton and cowpea (Onwualu, 2012). The inhabitants of the state also rear livestock like cattle, sheep, goats and chicken among others.

Multistage sampling technique was employed in this study. In Niger State, only five (Bida, Katcha, Wushishi, Shiroro and Kontagora) out of the existing twenty-five (25) LGAs are currently participating in the IFAD/VCDP. Three (3) sets of respondents namely: treatment, spillover and control units were sampled for the study. The treatment refers to the IFAD participants, spill-over are the non-participants residing in participating LGAs and control unit are the non-participants in the non-participating LGAs located 50 – 60km away from the participating LGAs. The first stage involved the random selection of one participating LGA from each of the three Agricultural Zones in the state and also one non-participating LGA that is 50 – 60km away from the selected participating LGA. Katcha, Shiroro and Wushishi are participating LGAs randomly selected while Lapai, Gurara and Mariga are the non-

participating LGAs selected. The second sampling stage involved a random selection of two participating villages from the selected participating LGAs (for treatment) and also two non-participating villages 20-30km away from the selected participating villages. The third stage involved a random selection of two active farmers' cooperative associations from each of the selected participating villages, non-participating villages from the selected participating LGAs as spillover, and non-participating villages from the selected non-participating LGAs. The fourth stage involved the use of Cochran formulae to determine the representative sample size from the sampling frame (registered farmers' cooperatives obtained from the IFAD office).

Accordingly; Cochran's formula is given by the equation:

$$Na = \frac{n_r}{1+\frac{nr-1}{N}} \ldots\ldots\ldots\ldots (1)$$

$$nr = \frac{(1.96)^2 pq}{e^2} \ldots\ldots\ldots\ldots (2)$$

Where:
Na = Adjusted sample size for finite population
nr = Sample size for infinite population
N = Population size
p = Proportion of Population having a particular characteristic

q_2 = 1 – P
e^2 = desired level of precision (0.05)

Thus, P = 0.01 and q = 1 – 0.01 = 0.99. Therefore, nr is computed to be 15. This is substituted in equation (1) to determine the sample size.

In the last stage, a total of 110, 90 and 95 representative respondents for the treatment, spill-over and control units respectively, were randomly selected. Presented in Table 1 is the sample frame of the respondents in the study area.

Primary data were collected for the study. This involved the use of a well-structured questionnaire accompanied by an interview schedule to collect relevant first-hand information from the respondents. The study employed both descriptive was used to summarize the data. Farm Budgeting Technique was used to determine the costs and returns to rice production among the respondents. Gross margin and total variable cost was calculated according to Boehlje and Eidman (1984) and net farm income was estimated according to Olukosi and Erhobor (1988). Poverty and food security status was measured using the Foster-Greer -Thorbecke Model (1984).

Results and Discussion

Socio-economic characteristics of small-scale rice farmers

Table 2 shows the distribution of rice farmers according to socio-economic characteristics. The participants and non-participants within the age group 31 – 40 years had the highest percents of 39.09% and 41.08% respectively. The result revealed that 13.64 percent of the participating farmers were aged between 21 to 30 years while 11.89 percent of farmers within the same age range were non-participants. Ten percent (10%) of the participating farmers fell within the ages of 51 and 60, while 9.19 percent were non-participants. This implies that the IFAD programme accommodates varying age ranges including young and old farmers. The pooled result indicated that the average age was 40 years with the higest frequent age group (31 - 40) among the rice farmers in the study area. This age bracket of the farmers are in their active and energetic to withstand the rigours of farming activities. This finding is in line with those of Lawal (2015) and Tondo and Iheanacho (2015) who in their studies reported high number of rice farmers in similar age range.

The result in Table 2 also showed that most of the participants of IFAD (97.27 percent) were male while only 2.73 percent were females. On the other hand, 94.05 percent of the non-participants were male while 5.95 percent were females. This implies that there were more males involved in rice production in the study area than females in Niger State. This conforms with the reports of Adesiji *et al.* (2016) and Folayan (2013).

The result of the household size distribution of rice farmers in the Table 2 revealed that more than half of the participating farmers (60.91 percent) had a household size of 6 to 10 members with the mean household size of 8 members. The non-participants with the same household size constituted 54.05 percent with the mean household size of 9 persons.

The implication of the finding is that non-participants with larger household size have to cater for more members hence the need to cultivate more than the IFAD recommended one hectare intervention. The pooled result revealed that the majority of rice farmers in the study area (56.61 percent) had a household size of between 6 and 10 members with the mean household size of 8 members. This result agrees with those of Lawal (2015), and Omorogbee and Onemolease (2008) that majority of the respondents had manageable household size, but contrary to that of Adagba (2014) who reported that the large household size makes the respondents in the study area to rely or depend on readily available and cheap family labour than hired labour.

The results of educational status in Table 2 showed that there is a higher illiteracy rate among the non-participants (10.81 percent) than the participants (8.18 percent). The implication is that non-participants tend to be more risk-averse hence will be less likely to adopt innovations such as the IFAD-VCDP project. On the other hand, 33.90% of the pooled respondents had secondary education while about 26.10% had primary education. This finding is in agreement Folayan (2013) and Danjuma *et al.* (2016) reported that majority of the farmers sampled in their separate studies attained an educational level of primary school and above; but is in disagreement with Adagba (2014), that concluded most of the respondents in the studied area had no formal education.

IFAD intervention is restricted to one hectare of farmland. Thus from the result of farm size of respondents in Table 2; those who have exactly one hectare or less were less likely to participate hence the higher percentage of non-participants (9.19 percent) with one hectare or less compared to the participants (9.09 percent) with the same farm size. The same trend was observed among respondents with a farm size of between one and two hectares i.e only 26.36 percent participated in the programme while 31.35 percent were non-participants. It is believed that a farmer is not likely to dedicate half or more than half of his entire farmland for a new programme. The pooled result showed that 40.34 percent of rice farmers cultivate between 2 to 3 hectares of land in the study area. This is an indication that the majority of respondents were small-scale farmers.

The result showed that the majority of the participants (90.91 percent) and 77.84 percent of the non-participants acquired their land through inheritance (Table 2). Also, 2.73 percent and 1.08 percent of the participants and non-participants respectively purchased their farmlands. This implies that those who had total ownership of their lands either through inheritance or purchase participated more in IFAD than those who have temporary rights to cultivate on their lands i.e borrowing community ownership or renting. The pooled result shows that majority of the rice farmers (82.71 percent) acquired their land through inheritance while 10.17 percent and 1.6 percent acquired their lands through borrowing and renting respectively. This is in agreement with the finding of Folayan (2013) who reported that the majority of Fadama farmers obtained their lands through inheritance.

The result of farming experience in Table 2 indicates that majority of the participants (43.64 percent) had been in the farming business for the period of 21 to 30 years with a mean of 19.8 while non-participants constitute 42.16 percent for the period of 11 to 20 years with a mean of 19.9. The result also reveals that 17.27 percent of the participants had a farming experience of 1 to 10 years while 16.76 percent of the non-participants had equal farming experience. This suggests that farmers with less farming experience enrolled more in the IFAD due to the advantages they stand to gain via training, input supply at subsidized rates and a readily available market for their produce. The pooled result showed that 39.32 percent of rice farmers in the study area had farming experience of 11 to 20 years while about 37.97 percent had a farming experience of 21 to 30 years. In summary, most of the rice farmers in the study area had adequate experience and knowledge of efficient resource utilization. This is related to the findings of Eze *et al.* (2017), reported that melon value chain actors (farmers) had been in the shelling business for a long time which enable them to adopt innovations easily and maximized their production with less time and stress-free.

The result of the extension contact in Table 2 showed that all the participants (100 percent) had extension contact with the extension agents while the non-participants indicate 80 percent of the farmers had extension contact during the studied period, and 20 percent had no extension contact, the pooled result

indicates that 87.46 percent of the respondents had extension contact with only 12.54 percent that had no contact with extension agents. This implies that IFAD-Programme provided adequate extension service to their participating farmers, considering its impact on better management of limited resources to achieve a better result.

The result in Table 2 also revealed the type of rice varieties been cultivated by the participants and non-participants 96.36 percent used improved rice varieties of seeds, while 3.64 percent used local rice seed varieties. Non-participants on the other hand indicated that the majority (67.57 percent) of the rice farmers used local rice seed varieties while 32.43 percent used improved varieties. The implication is that IFAD supply inputs to its participating farmers which are mostly on the grant to ensure they achieve the target of producing higher output. Non-Participants decided to continue with the use of their local varieties of rice which may be due to the expensive nature of the improved varieties. However, the pooled result indicates that the majority (56.27 percent) of the rice farmers used improved varieties while 43.73 percent of the farmers used local seed varieties in the study area. The implication is that farmers are gradually adopting the use of improved varieties, considering the effect it has on the output of their colleagues.

Costs and returns estimates per hectare of rice production

The result of the analysis in Table 3 showed that the average output of rice farmers who participated in IFAD was 64.25 bags of 75kg per hectare. They incurred a total cost of N97,378.83k, made up of N92,562.95k total variable cost (TVC) and N4,815.88k total fixed cost (TFC), which accounted for 95.05 percent and 4.95 percent, respectively per hectare.

On the spill-over response, the result indicated that the average output of rice farmers was 40.20 bags of 75kg per hectare. Total cost (TC) of N102,148.70k was incurred which comprised of N90,292.28k TVC and N11,856.42k TFC on the accounting of 88.39 percent and 11.61 percent per hectare for each component (TVC and TFC).

For the control group, the result showed that the average output of 38.40 bags of 75kg per hectare was realized, and incurred a total cost of N108,364.17k which comprise of N98,957.92k and N9,406.25k as the TVC and TFC, respectively. This accounted for 88.39 percent as a variable component and 11.61 percent for a fixed component. The cost component analysis indicated that the participants incurred the highest cost on hired labour followed by NPK fertilizer, while knives recorded the least cost (depesation). The highest cost item for the spill-over group was NPK with sprayers and knives recorded highest and lowest fixed cost item respectively. Family labour was the highest cost item for the control group while depreciation on fixed items such as sprayer and knives recorded the highest and least cost respectively. Meanwhile, in terms of this cost structure, Ndanitsa (2005) reported that production activities usually involve the use of resources, otherwise called inputs, which have costs in terms of their procurement. some of these costs are non-cash costs as the inputs belonged to the farmers and therefore, do not involve physical exchange of cash before using them (Ndanitsa, 2005). These include fertilizer, pumps, fuels, agrochemicals, transportation, farm tools, hired and communal labour. The costs are therefore classified into variable and fixed costs. The major components of the variable costs in all enterprises were the cost of fertilizers, marketing, seeds, agrochemicals, tractor hiring services, irrigation and labour. The researcher also reported that the fixed costs are very small and include depreciation charges on assets.

In addition, the estimated total revenue per hectare earned by the participants was N686,842.31k representing N682,026.44k as gross margin and N589,463.48k as net farm income with N6.05 as return on investment (ROI). The spill-over group on the other hand earned N404,642.39k as total revenue covering N393,785.97 as gross margin and N302,493.70k for Net Farm Income, exhibiting Return on Investment of N2.96. while the control group earned N398,656.74k representing N389,250.49k as gross margin and 290,292.57k as Net Farm Income with N2.67 as ROI.

Comparing the total revenue (N686,842.31k) and ROI (6.05) of participants with those of the spill-over and control groups revealed a clear difference which suggested that IFAD-VCDP had a significant impact on the profitability of the participants. Also, the revenue and ROI of the spill-over group was higher than that of the control group by virtue of their

closeness to the participating rice farmers. Also, the revenue and ROI of the spill-over group is higher than that of the control group by virtue of their closeness to the participating rice farmers. This result conforms to the findings of Ibitoye *et al.* (2014) and Emeka and Ugwu (2015) who in their various studies reported that rice farming was profitable in their studied areas, especially among value chain actors.

Meanwhile, Ndanitsa (2005) also reported a higher NFI for Fadama rice value chain actors, and said, this is not only because of effective exploitation of available human and material resources but also because of better marketing prospect, consequent of the Federal Government's ban on importation of food items, especially rice.

Effect of IFAD on poverty status and food security status of the participants

Results of poverty status of participating farmers before and after benefiting from IFAD, presented in Table 4 shows that the average income of the participants before benefiting from the programme was N206,260.91k, while the average income of the participants after benefiting from the programme was N468,507.58k. This implies that IFAD had a positive impact on the income of participants. Further analysis showed that the income of 24.54% of the participating farmers in the study area earned below N206.91k before the programme, while 26.36% reported earned below N468,507.58k after benefiting from the programme. The poverty gap or the extent to which a population fall below the poverty line was 28.21% and 18.15% before and after benefiting from the programme respectively. This suggests that the "poor" among the participants after benefiting from the programme are closer to the poverty line than the "poor" before the programme. This can be seen from the severity index in which only 5.25% of the participating farmers are suffering from severe poverty as compared to 13.23% before benefiting from the programme. This result is in conformity with the findings of Girei *et al.* (2013), Osondu *et al.* (2015), Folorunsho *et al.* (2017), Ndanitsa (2014) and Moses (2017), who in their various studies reported that poverty incidence, poverty depth and poverty gap of the participants were less than that of the non-participants in their studied areas. In the whole, the result shows that IFAD had a positive impact on alleviating poverty among the participating rice farmers in the study area.

The result in Table 5 showed that on average, participating farmers spent N20,567.54k on purchase of food items per month before benefiting from the programme whereas, their average food expenditure per month rose to N37,293.00k after participation. This is due to the availability of more disposable income arising from the increased output. The headcount index or proportion of those whose expenditure on food items is below the average is 60.91% and 64.94% for before participating and after participating respectively. In other words, 60.91% of the participants were "food insecure" before the programme. This increased to 64.94% after participation. The reason may be that most of the participants spent the additional income generated in other areas such as education, housing, accessing better health care services, purchase of motorcycles and cars, etc. as a means of improving their standard of living rather than spending it on food items. Ndanitsa (2014), did a study on impact of microfinance providers on farm households in North-central Nigeria, reported that the facility indirectly has a positive influence on nutrition and healthcare because the increased income of the beneficiaries invariably had led to higher nutrition (through better intake of protein, vitamins and mineral diets) and greater access to healthcare. Increase in income from higher investment opportunities as a result of more capital (similar to IFAD) has enabled the participant to acquire mosquito-treated nets, and has reduced the incidence of malaria, especially for children.

In addition, food insecurity gap or the extent to which the respondents fall below the food expenditure line after the programme is 25.77%, which is lower than the food insecurity gap before the programme (33.77%). Similarly, the severity of those that can be classified as "food insecure" reduced from 14.27% before the programme to 8.92% after the programme. Therefore, it can be concluded that IFAD contributed positively to improving the food security status of the respondents. Which is in agreement with that of Olaolu *et al.* (2015) and Sanni *et al.* (2017) who in their separate studies observed that the programme beneficiaries were more food secured than non-beneficiaries.

Conclusion and Recommendations

The study revealed that higher investment by small scale farmers through financial capital assistance, either in form of money or input enhance more

investment by the beneficiaries. Capital assistance by IFAD has gone a long way in increasing farmers' investment opportunities in the study area. The rice production enterprise was also found to be profitable but mostly dominated by low to medium income earners reflecting positive results of government intervention towards ensuring food security and sustainable income by the small-scale farmers. Opportunities still exist for the farmers to improve their rice production potential via enhancement of their technical, cost and allocative efficiencies which, IFAD had impacted positively in improving income status and alleviating poverty of participating farmers in the area.

The study recommended that (i) both government and non-governmental organizations should provide the needed infrastructure and operational facilities to improve the production level and value rice addition, (ii) the government and non-governmental organizations should provide incentives to rice farmers such as subsidies on quality input items such as improved seeds fertilizers and agrochemicals; strengthened the existing extension services in the study area. (iii) the land area under the IFAD-VCDP be increased from one hectare to at least five hectares to increase productivity, increase income and alleviate poverty in the area and (iv) government at all levels should give utmost priority to the regular and timely payment of counterpart fund so as to ensure continuity and sustainability of the programme.

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Table 1:Sampling frame for participants and non-participants

Group	LGAs	Agricultural Zones	Villages	Farmers' Organizations	Sample Frame
Treatment	Katcha	I	Baddegi	ManagiBadeggi Farmers	24
				CMPSAninciEbantiTwakiCMPs Ltd	25
			Edotsu	Edotsu Co-Operative Credit & Marketing CMPs	25
				EdotsuJinjinWugakunYenaCMPs	25
	Shiroro	II	Baha	Baha Abmajezhin Cooperative Multi-Purpose Society Ltd	15
				AbwanuboNajeyi Development Association, Tawali Baha Agbudu	18
			Paigado	PaigadoAchajebwa Development Farmers Soc.	25
				PaigadoFarmers Cooperative Society Ltd	25
	Wushishi	III	Bankogi	BankogiAlheri Farmers Coop. Multipurpose Soc Ltd	22
				BankogiGwariNasaraCMPS	16
				Kanko Arewa Farmers	25
			Kanko	Kanko UnguwarNdakogi Cooperative Mulitpurpose Society Ltd..	25
Spillover Effect	Katcha	I	Kangi Toga	Kangi Toga Farmers Cooperative	20
				Kangi Toga Youth Farmers Cooperative Society Ltd	15
			SheshiDama	SheshiDamaFarmers Cooperative Shinkafamana	18
				Multipurpose Farmers Cooperative SheshiDama	15
	Shiroro	II	Farindoki	Ayenaje Multipurpose Development Association	20
				Farin-DokiErena	15
				Farindoki Youth Farmers Cooperative Society Ltd	
			Zhikuchi	GenukoFarmers Cooperative Society Ltd	10
				ZHikuchi rice Farmers Cooperative Society Ltd.	12
	Wushishi	III	Gwarijiko	GwarjikoFarmers Cooperative Kyadyafu Cooperative society Gwariji	10
			Fugangi	FugankpanFarmers Cooperative	13
				Fugan Youth Farmers Cooperative Society	10
				Sub-Total	**174**
Control	Lapai	I	Gbage	Gbage Youth Farmer Cooperative Society	15
				Gbage Rice Farmer Cooperative Society Ltd	20
			Puzhi	PuzhiShinkafamana Farmers C.S. Ltd	12
				PuzhiShinkafamana Farmers C.S. Ltd	18
	Gurara	II	Tufa	Yanga multipurpose cooperative association	19
				Abawa rice farmers association	10
			Lambata	Lambata Rice Farmers Cooperative Multipurpose Society Limited	15
				Boku/Sarkigbadagu development association	14
	Mariga	III	Kahigo	KahigoFadama user Cooperative society	17
				Young Farmers Cooperative Multipurpose Society Limited	20
			Bobi	Respect cooperative association cooperative multi-purpose society limited	13
				BobiHimma irrigation cooperative society	20
				Sub-Total	**193**
				Grand Total	**693**

Source: IFAD – VCDP farmer database and Niger State Agricultural Development Authority (NAMDA), 2018

Table 2: Distribution of rice farmers according to socio-economic characteristics

Variables	Participating (n=110) Freq. (%)	Non-Participating (n=185) Freq. (%)	Pooled (n=295) Freq. (%)
Age			
21 – 30	15 (13.64)	22 (11.89)	37 (12.54)
31 – 40	43 (39.09)	76 (41.08)	119 (40.34)
41 – 50	40 (36.36)	69 (37.30)	109 (36.95)
51 – 60	11 (10.00)	17 (9.19)	28 (9.49)
> 60	1 (0.91)	1 (0.54)	2 (0.68)
Mean age	40	41	40
Gender			
Male	107 (97.27)	174 (94.05)	281 (95.25)
Female	3 (2.73)	11 (5.95)	14 (4.75)
Household Size			
1 – 5	24 (21.82)	34 (18.38)	58 (19.66)
6 – 10	67 (60.91)	100 (54.05)	167 (56.61)
11 – 15	16 (14.55)	45 (24.32)	61 (20.68)
16 – 20	1 (0.91)	6 (3.24)	7 (2.37)
> 20	2 (1.82)	0 (0.00)	2 (0.68)
Mean	8	9	8
Marital Status			
Single	4 (3.64)	4 (2.16)	8 (2.71)
Married	104 (94.55)	177 (95.68)	281 (95.25)
Divorced	0 (0.00)	2 (1.08)	2 (0.68)
Widow/Widower	2 (1.82)	2 (1.08)	4 (1.36)
Educational Status			
Primary	34 (30.91)	43 (23.24)	77 (26.10)
Secondary	39 (35.45)	61 (32.97)	100 (33.90)
Tertiary	17 (15.45)	30 (16.22)	47 (15.93)
Qur'anic	11 (10.00)	31 (16.76)	42 (14.24)
None	9 (8.18)	20 (10.81)	29 (9.83)
Farm Size			
≤ 1.0	10 (9.09)	17 (9.19)	27 (9.15)
.2.0	29 (26.36)	58 (31.35)	87 (29.49)
2.01 – 3.0	49 (44.55)	70 (37.84)	119 (40.34)
3.0 – 4.0	16 (14.55)	26 (14.05)	42 (14.24)
4.01 – 5.0	6 (5.45)	13 (7.03)	19 (6.44)
< 5.0	0 (0)	1 (0.54)	1 (0.34)
Mean	2.78	2.75	2.76
Land Acquisition			
Inheritance	100 (90.91)	144 (77.84)	244 (82.71)
Purchase	3 (2.73)	2 (1.08)	5 (1.69)
Borrowed	6 (5.45)	24 (12.97)	30 (10.17)
Community Owned	1 (0.91)	12 (6.49)	12 (4.07)
Rented	0 (0.00)	3 (1.62)	4 (1.6)
Farming Experience			
1 – 10	19 (17.27)	31 (16.76)	50 (16.95)
11 – 20	38 (34.55)	78 (42.16)	116 (39.32)
21 – 30	48 (43.64)	64 (34.59)	112 (37.97)
31 – 40	5 (4.55)	12 (6.49)	17 (5.76)
Mean	19.8	19.9	20.0
Extension Contact			
Yes	110 (100.00)	148 (80.00)	258 (87.46)
No	0 (0.00)	37 (20.00)	37 (12.54)
Seed Varieties Used			
Local	4 (3.64)	125 (67.57)	129 (43.73)
Improved	106 (96.36)	60 (32.43)	166 (56.27)

Source: Computed from field survey, 2018

Table 3: Costs and returns analysis of the treatment, spill-over and control groups

Cost Items	Treatment			Spill-over			Control Groups		
	Quantity/ha	Unit Price (N)	Total Cost (N)	Quantity/ha	Unit Price (N)	Total Cost (N)	Quantity/ha	Unit Price (N)	Total Cost (N)
Variable Costs									
Rice Seeds (kg)	39.05	267.07	10,428.23	84.87	168.69	14,316.46	75.63	264.68	20,016.20
NPK (kg)	173.62	97.90	16,997.27	148.31	138.20	20,497.41	121.88	98.28	11,978.03
Urea (kg)	95.69	102.93	9,849.98	109.55	141.24	15,472.48	71.61	65.92	4,720.59
Manure (kg)	-	-	-	2.00	2,000.00	4,000.00	0.42	57.29	23.87
Chemicals (ltr)	5.92	1,777.18	10,517.69	4.85	2,039.33	9,898.75	6.88	1,937.50	13,320.31
Family Labour (MD)	13.00	1,300.00	16,900.00	14	1,020.08	14,281.11	16.00	2,027.65	32,442.39
Hired Labour (MD)	15.00	1,300.00	19,500.00	6	972.82	5,836.94	8.00	1,147.56	9,180.47
Transportation		6,825.02	6,825.02		5,590.05	5,590.05		6,564.41	6,564.41
Loading/Offloading		1,544.77	1,544.77		399.08	399.08		711.63	711.63
Total VC	**344.27**	**13,214.88**	**92,562.95**	**371.59**	**12,469.48**	**90,292.28**	**302.41**	**12,874.92**	**98,957.92**
Fixed Costs									
Hoes (Dep)	-	-	1,305.99	-	-	1,185.96	-	-	1,180.73
Sprayers (Dep)	-	-	1,929.97	-	-	8,933.71	-	-	6,851.56
Knives (Dep)	-	-	478.10	-	-	306.44	-	-	364.06
Cutlasses (Dep)	-	-	1,101.82	-	-	1.430.32	-	-	1,003.65
Others (Dep)	-	-	-	-	-	-	-	-	6.25
Total Fixed Cost	**-**	**-**	**4,815.88**	**-**	**-**	**11,856.42**	**-**	**-**	**9,406.25**
Total Cost	**-**	**-**	**97,378.83**	**-**	**-**	**102,148.70**	**-**	**-**	**108,364.17**
Returns									
Quantity Sold (Kg)	49.49	10,690.91	526,102.81	28.81	10,065.17	289,967.33	30.24	10,382.81	313,971.92
Quantity Consumed (kg)	8.04	10,690.91	85,916.03	6.91	10,065.17	69,551.45	3.65	10,382.81	37,908.08
Quantity Gifted (kg)	6.72	10,690.91	71,823.47	4.48	10,065.17	45,123.62	4.51	10,382.81	46,776.73
Total Revenue	**64.25**	**32,072.73**	**686,842.31**	**40.20**	**30,195.51**	**404,642.39**	**38.40**	**31,148.44**	**398,656.74**
Gross Margin	-	27,256.85	682,026.44	-	18,339.09	392,785.97	-	21,746.35	389,250.49
Net farm income	-	14,041.97	589,463.48	-	5,869.61	302,493.70	-	8,871.43	290,292.57

Source: Computed from field survey, 2018

Table 4: Poverty Status of Participants before and after benefiting from IFAD-VCDP

	Before	After
Poverty Line (N)	206,260.91	468,507.58
Frequency of "Poor"	27	29
Frequency of "Non-Poor"	83	81
Headcount Index (%)	24.54	26.36
Poverty Gap Index (%)	28.21	18.15
Severity Index (%)	13.23	5.25

Source: Computed from field survey, 2018

Table 5: Food Security Status of participants before and after benefiting

	Before	After
Food Expenditure Line/Month (N)	20,567.54	37,293.00
Frequency of "Food Insecure"	67	71
Frequency of "Food Secure"	43	39
Headcount Index (%)	60.91	64.54
Food Insecurity Gap Index (%)	33.77	25.77
Severity Index (%)	14.27	8.92

Source: Computed from field survey, 2018

Table 4: Regression Estimates for non-participants Functional Forms

Variables	Linear	Double-log	Exponential	Semi-log
Constant	-6531.24 (0.36)	12.89526 (10.47)***	10.19893 (35.03)***	180642.2 (2.05)**
Farm size	51346.11 (11.32)***	1.114114 (10.70)***	0.7126 (9.85)***	71080.97 (9.55)
Labour	187.5668 (0.87)	0.2392398 (1.06)	0.0003 (0.09)	32323.06 (2.00)**
Fertilizer	-24.7027 (-0.56)	-0.0886027 (-0.69)	-0.000389 (-0.55)	-6528.7 (-0.71)
Seed	-29.5345 (-1.71)*	-0.2104776 (-1.70)*	-0.0016466 (-1.91)*	-12198.9 (-1.37)
Agrochemicals	3641.0 (2.08)**	0.0741697 (0.47)	0.0176135 (0.63)	18205.61 (1.63)
Capital	4.148 (3.09)***	0.2274516 (2.18)**	0.0000294 (1.38)	24351.40 (3.27)***
Extension contact	0.41308 (1.68)*	0.0088843 (1.61)	4.09E-06 (1.05)	781.0058 (1.42)
R^2	0.5922	0.5328	0.5008	0.5032
Adjusted R^2	0.5070	0.5028	0.4687	0.4712
F-ratio	22.6	17.76	15.62	15.77

Source: Data Analysis, 2016

Note: *, **, and *** implies statistical significance at the 10%, 5% and 1% probability level respectively. Figures in parentheses are the respective t-ratios.

Table 5: Regression Estimates for Pooled without dummy Functional Forms

Variables	Linear	Double-log	Exponential	Semi-log
Constant	44783.3 (1.20)	15.04701 (13.21)***	11.36088 (56.59)***	161898.6 (0.71)
Farm size	79766.5 (5.05)***	1.260948 (9.88)***	0.711152 (8.63)***	137592.5 (5.38)***
Labour	-1655.6 (-3.05)***	-0.3593127(-1.87)*	-0.0102023(-3.49)***	-61644.5 (-1.60)
Fertilizer	772.59 (7.28)***	0.5778393 (4.52)***	0.0028715 (5.02)***	154424.9 (6.02)***
Seed	-749.938 (-4.76)***	-0.8005996 (-7.87)***	-0.0064503 (-7.59)***	-98851.42 (-4.85)***
Agrochemicals	5986.6 (1.58)	0.0676713 (0.52)	0.005761 (0.28)	40738.3888 (1.56)
Capital	7.099055 (1.74)*	0.2321966 (3.25)***	0.0000413 (1.88)*	28200.77 (1.36)
Extension contact	0.2453219 (0.51)	0.0106026 (1.80)*	1.61E-06 (0.62)	2172 (1.84)*
R^2	0.5796	0.6206	0.6107	0.5228
Adjusted R^2	0.5666	0.6089	0.5986	0.5080
F-ratio	44.52	52.81	50.64	35.37

Source: Data Analysis, 2016

Note: *, **, and *** implies statistical significance at the 10%, 5% and 1% probability level respectively. Figures in parentheses are the respective t-ratios.

Table 6: Regression estimates for pooled with dummy Functional Forms

Variables	Linear	Double-log	Exponential	Semi-log
Constant	-116204.50 (-3.80)***	13.873 (18.14)***	10.38867 (7035)***	-47041.06 (-0.27)
Farm size	74911.40 (6.29)***	1.1104 (12.93)***	0.681832 (11.87)***	11.798.2 (5.73)***
Labour	-49.17 (-0.12)	0.1369 (1.40)	-0.0005 (-0.0005)	26671.11 (0.90)
Fertilizer	286.98 (3.26)***	-0.0281 (-0.30)	-0.00006 (-0.14)	46571 (2.23)**
Seed	34.04 (0.26)	-0.1516 (-1.94)*	-0.001715 (-2.64)***	16654 (0.94)
Agrochemicals	4035.30 (1.42)	0.0114 (0.13)	-0.006022 (-0.44)	30724.08 (0.94)
Capital	5.07 (1.65)	0.2039 (3.95)***	0.00002 (1.96)*	23164.77 (1.49)
Extension contact	-0.07 (-0.20)	0.0032 (0.82)	-3.00E-07(-0.17)	859.55 (0.97)
NSRIC	211987.50 (13.18)***	0.2748 (16.74)***	1.2802 (16.49)***	48910 (13.24)***
Participation				
R^2	0.7627	0.8311	0.8237	0.7318
Adjusted R^2	0.7543	0.8251	0.8174	0.7222
F-ratio	90.40	138.36	131.40	76.72

Source: Data Analysis, 2016

Note: *, **, and *** implies statistical significance at the 10%, 5% and 1% probability level respectively. Figures in parentheses are the respective t-ratios.

Table 7: Commercialization constraints faced by respondents

Constraint	Participants			Non-participants			Pooled		
	Total score	Mean score	Rank	Total score	Mean score	Rank	Total score	Mean score	Rank
Poor access roads to marketing centres	6116	52.27	I	6211	53.09	I	11822	50.52	II
Unfavourable market price	5894	50.38	IV	5821	49.75	IV	12003	51.29	I
Inadequate storage facilities	5789	49.48	VII	5792	49.50	VI	10696	45.71	VIII
Distance to market centres	6024	51.49	III	5820	49.74	V	11704	50.02	IV
Fluctuation in prices	5884	49.95	VI	5684	48.58	VIII	11607	49.60	V
Buyers dictating prices	5880	50.26	V	5701	48.73	VII	11585	49.51	VI
Inadequate market information	5478	46.82	X	5581	47.70	IX	10087	43.11	X
Lack of government policy on commercialization	5529	47.26	VIII	6111	52.23	III	11806	50.45	III
Inadequate market infrastructure	6078	51.95	II	6123	52.33	II	11551	49.36	VII
Inadequate access to means of transport	5517	47.15	IX	5539	47.34	X	10595	45.28	IX

Source: Field survey, 2016

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