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Success Story and Factors Affecting Level of Income Earned from Improved Potato Farming in Damot Sore Woreda, Wolaita and Southern Ethiopia

Bassa Z*, Abera A, Zeleke B, Alemu M, Bashe A and Areka MS

Southern Agricultural Research Institute, Areka Agricultural Research Center, Areka, Ethiopia

Abstract

Increasing production and productivity of crop farming ,improving income of resource poor farmers and thereby enabling the producers to build assed in Southern Ethiopia in General and Damot Sore Woreda in particular require some form of transformation of the subsistence, low-input and low-productivity farming systems to full agricultural packages utilization and awareness creation. The study was employed in Irish AID Operational Research and Technology Dissemination Project (ORTDP) areas of Areka mandate. This study was undertaken to analyse factors affecting level of income earned from Potato and summarize benefits of utilizing improved potato variety and full agricultural packages in the district. A multi-stage sampling technique was used to select 80 sample households from two sample kebele. In the study, both primary and secondary data sources were used. Simple Linear Regression Model was employed to identify factors affecting level of income earned from improved potato production by resource poor farmers in the district. Results showed that using improved potato variety increase the production and productivity of the specific commodity and there help the resource poor farmers to build asset. From eight explanatory variables used the six determinant factors that affected significantly the level of income earned from improved potato adoption were comprised of Tropical livestock unit, Being beneficiary or not, family size and intervention period.

Keywords: ORTDP; Improved potato; Agricultural technologies

Introduction

In Southern Nations, Nationalities, and Peoples Region, (SNNPR) particularly the project target Woredas are characterized by persistent food insecurity with many farming household not producing enough food and income to meet household food requirements. Improved agricultural technologies largely focusing on increasing yield and market value have an important role in increasing productivity, income and building asset and improving household food security. The increased agricultural productivity also boosted by the availabilities and access of new and improved agricultural technologies. Improved agricultural technologies, management practices, and inclusion of resource poor household for enhanced technological access also have a proven track record on improving food security and decreasing susceptibility to individual stresses. Thus, investing in dissemination of improved agricultural technologies is key to improve the livelihood of low-income and food insecure households. By recognizing this, Irish Aid has launched technology dissemination initiative with aims to reducing poverty for poor and marginalized farmers, particularly women; driving agricultural growth by linking poor farmers into new and improved crop, livestock, and natural resource conservation technologies.

The Operational Research Technology Dissemination project (ORTDP) is addressing key agricultural development challenges prioritized by both the Ethiopian and Irish governments: improved food security, poverty reduction and greater gender equity, better nutrition outcomes and more climate resilient food and farming systems through supporting of rural poor household by accessing for improved agricultural technologies. Southern Agricultural Research Institute (SARI) in collaboration with Irish-Aid has been currently investing in agricultural research and dissemination of improved agricultural technologies focusing on crop, livestock, and natural resource management. The technologies being disseminated are tested and proven to have potential for up scaling to improve productivity, food and nutrition security, and climate resilience of resource poor farmers. For the past five years, the project has disseminated more than 33 proven crop, livestock, and natural resource management technologies for more than 13266 resource poor household in seven food insecure Woredas of the region especially for whose landholding less than 0.25 hectare and women.

The project has reviewed its performance and status to lay out strategic directions and priorities for agriculture technologies dissemination and extension in the region. As one component to address the OR project goal particularly to improve income level and thereby build asset, reduce poverty or improve nutrition, potato is one of the crop technologies disseminated by the project and its performance has been evaluated giving an account in addressing issues related to productivity, income, nutrition and adaptability to ever changing environment. Of the technologies successfully disseminated by the project, the potato case studies presented as proven best-bet agricultural technologies and innovations that are available for uptake and up scaling. This case study was conducted in two Kebele of ORTDP in Wolaita Zone in Damot Sore Woreda. Farmers for the case study were selected using multistage sampling techniques. Thus, from the project Woreda 24 none beneficiaries (6F and 18M) and 56 beneficiary farmers (15F and 41M). The household survey included 50% of 2014/15 and 2015/16 beneficiary farmers. Data collection sheet was prepared to collect quantitative and qualitative data regarding the productivity, income, food, asset building and asset type, nutrition, trends on use of improved seed, adoption, and challenges. The data collected was subjected for simple descriptive statistical analysis.

***Corresponding author:** Bassa Z, Southern Agricultural Research Institute, Areka Agricultural Research Center, Areka, Ethiopia, Tel: 251913918474/25167805030; E-mail: bassazekarias@yahoo.com

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Justification of the intervention

Potato is one of highland root and tuber crops produced on tow cropping seasons (Belg and Meher season) and mainly in Belg Season in the district. Potato is produced mainly as cash crop and in some extent as food crop by farmers in the area. Despite its role in the farming system and in supporting the national economy, yield has been low and stagnant for several years due to different reasons. There could be several reasons for this but the most important ones are lack of improved varieties with desirable agronomic practices, lack of awareness for farmers on hot to preserve improved seed, low yield potential of local varieties, and diseases. Especially low production and distribution of improved seed is limited among resource poor farmers. Besides this, the access of the improved varieties has been low for poorest farmers. Therefore, ORTDP project has proposed to promote various improved potato varieties (Belete and Gudene Variety) for five consecutive years and Belete for the past two years and Belete and Gudane for production period of 2015/16 that aimed to improve income, diversify diets, build asset and improves nutritional status of poorest households in six project intervention Woreda.

In Ethiopia, potato is produced on 66,361.67 hectares with an average national yield of 136.86 quintals in Meher cropping season. The major potato producing regions of Ethiopia and their Meher cropping land size in ha summarized as Oromiya 38256.15 ha , Amhara 17719.49 ha and SNNPR 10727.13 ha states in that order of production levels. From total Southern Nations Nationality People region area covered by potato, 1958. 12 ha potato area held by Wolaita zone (5.5%) in Meher cropping season. The average regional productivity of potato was 166.48 quintal per ha and that of Wolaita zone was 190 quintal per ha [1].

Methodology

Damot Sore is one of the Woreda in the Southern Nations, Nationalities, and Peoples' Region of Ethiopia. Part of the Wolaita Zone Damot Sore is bordered on the southeast by Sodo Zuria, on the west by Kindo Koysha, on the northwest by Boloso Bombe, and on the north by Boloso Sore. Damot Sore was separated from Boloso Sore woreda. Damot Sore has total of 20 Kebele and of which two are town administrative.

The Pre extension and Demonstration of Irish Potato trails were planted in Damotsore project Kebele namely Sheymba and Doge Hanchucho. The amount of improved potato disseminated per household amounted to 2 quintal in 2015 and 2014 intervention period per household. During provision of the improved potato farmers were trained on land preparation, ways and benefits of improved potato adoption. The beneficiary farmers were selected based on their participation in Safety Net program and food security level, land size owned in ha, gender base and considering other socioeconomic factors. The improved potato varieties introduced to the district were Bele potato Variety and Gudene potato variety.

Result/Achievement

In five project intervention years, ORTDP has addressed 310 direct beneficiaries and 930 indirect resource poor households with improved potato dissemination, especially for farmers who unable to access improved seeds and had smaller land (farmers their landholding less than 0.25 ha). The project had been provided 1020 quintals of four improved potato varieties (Jaleni, Belete and Gudane) and popularized on 51 hectare of land throughout the project intervention years. These varieties have been successfully promoted in all Woreda using cluster-based approaches accompanying with practical agronomic practice training and its related input as a package. Participatory technology dissemination method and cluster approach was a key element of the implementation of this project. Awareness creation of beneficiary farmers, development agents, Woreda agricultural experts and Office heads and demonstration of technology dissemination at Farmers Training centres were the basis of the Technology popularization and pre-scaling up in the district.

Improved productivity

Based on the suitability and agro-ecological adaptability of crops ORTDP has disseminated different crop varieties for beneficiaries. While the project proposes three potato varieties for demonstration, the primary criterion was its contribution to increase of productivity of potato. The advantages of theses potato varieties include their high yield potential, disease tolerance, drought tolerance, early maturity, high market value and nutritional values. The survey report confirmed that yields of improved potato have 100% higher than locally available potato variety in the districts and more than 60% beneficiary farmers built asset at housed level inform of cattle, sheep and poultry, able construct their house and purchase agricultural input without credit. In addition to these, the economic strata of certain farmers changed from very poor to be graduated from Safety net program and from zero livestock ownership to more than two units of livestock. The main reasons for increase in the productivity of improved potato listed as timely dissemination of inputs, full package application of the technologies, relatively suitable weather condition and practical capacity building of subject matter specialists. The survey result also revealed that farmers tendency to use adequate fertiliser especially UREA was improved in the district.

Food and nutrition security

Increased production has also led to significant improvement in food security and nutrition. As survey report, over 100% of project beneficiary household consume potato at least once in a week while only 23% of non-beneficiary household consume potato at least once in a week. Consumption of potato was much more prevalent in among beneficiaries, while lesser extent among non-beneficiaries. From potato production in 2014 fiscal year more than 90 per cent products sold for cash source that helped to build asset and this indicates that project beneficiaries tend to produce more for cash source and the remaining for food and seed source. Through their consumption household can have food nutrients like protein and iron that potato contains. While it reveal some interesting trends on contribution to nutrition, what is not mean that household access all required food items that meets the nutritional security standards (amount of kilo calories per day/week). The data to what extent reflects the availability and access of potato, which rich in carbohydrate through their own production. This also have a significant contribution to food security with many nutritional benefits, as it is rich in protein, iron, zinc, and dietary fibre. These constituent contributed to the improvement in food and nutrition and the potato acceptance by farmers.

Improved income

Farmers in two Woreda (Damot Sore and Mierab Badawacho) use potato both for cash generation and for home consumption although the majority use for cash. Potato is grown in both production seasons; Belg and Meher seasons with the main growing season being Belg. Farmers are in great need of cash for the Meher season especially wheat and teff producing Woreda to buy agricultural inputs like fertilizer and seed. The yield of the new varieties is about five times those of local

variety and generated an additional income for household. Therefore, potato is strategic cash crop, which fulfils the immediate cash demand for input purchase thereby built asset. During interviewees farmers mentioned that most of the potato produced during Belg season is sold to generate income. As indicated in the baseline report, crop income for farmers in SNNPR ORTDP project Woreda comes from sale of cereals such as sweet potato, wheat, teff and common bean. After five years of project implementation, the annual mean cash income obtained only from sale of potato for both project beneficiaries and non-beneficiaries increased.

Adoption

The potato varieties disseminated by the project were evaluated against the local variety by using 13 criteria. More than 100% farmers in the survey districts evaluated Belete and Gudane Variety by seed size, taste, early maturity, yield, taste, and marketability. Over all rank calculated shows that Belete and Gudene Potato Variety have first preference by farmers in the all project location in comparison to local variety. Trends on planting of improved potato varieties in project Woreda during base lines ranged from 10% to 40% with mean value 27.8%. After four years of intervention, trends on use those potato varieties has become 75%. Three different successful aspects of the new Potato varieties were identified by farmers during the survey: improved taste, higher productivity, and market-preferred attributes reported among both beneficiaries and non-beneficiaries. As this was one of the outputs of the operational research programme, and 70% of households included in the survey were programme participants, it suggests more work has to be done through regular extension in disseminating and promoting of those improved potato varieties among non-beneficiary household.

Drivers to success

The higher productivity, marketability, seed size and taste of farmers were the main drivers for the successful dissemination of those potato varieties. Beside this, the project full package approach enables poorest to increase their productivity using fertilizer as a package. The use of adequate fertilizer for the potato especially NPS were uncommon in most projects Woreda and the project has tried to demonstrate the yield difference using NPS fertilizer. Moreover, the project's cluster based technology dissemination and transfer approach played a significant role to easily diffusion of knowledge and practice from one cluster to the other and created a critical mass on disseminated technologies.

Challenges

Despite the significant contribution of potato for food security, asset building, income and nutrition some challenges are also faced the small scale farmer (wilting disease, awareness problem of farmers on keeping and preservation up of seed). Farmers reported that the susceptibility to disease and pest and less tolerant to flood and heavy rainfall and management problem especially improper application of fertilizer. The significant number of farmers reported that they have not applied fertilizer mainly NPS as recommended rate and rarely used UREA. The other main challenges in dissemination of potato technology were erratic rain fall. Erratic rain fall in the district manifested as rain fall scarcity in 2014/15 and heavy rain during earthling up in the fiscal year of 2015/16. The other challenges faced in dissemination of the technology were high personal benefit expectation form Woreda experts and development agents and wrong belief of farmers over seed raising and preservation.

Opportunities for further scaling up

High productivity, attractive size of seed, early maturity, its seed size, its taste, high market value, and marketability played a significant contribution for the successful popularization and adoption of potato varieties disseminated in project Woreda as well as beyond project area.

Key lesson and recommendation

The interventions in agricultural research and dissemination have been strong components in strategies to promote sustainable agricultural development. Previously the technology dissemination approaches were focused on strengthening the productivity aspects of the technologies. Currently the project has disseminated the potato varieties focused demand of farmers (Figure 1). The project considers the multi-benefits and interactions of potato technologies disseminated with interest and demands of farmers for technologies. In all project Woreda, farmers give equal priority for income generating potential of technology as productivity potential. Therefore, potato technologies disseminated by the project has great demand by the community for food consumption as well as for income source and is a major crop in the area. A technology, which has great demand by beneficiaries, have multi-benefit and agro-ecologically suitable, ultimately leads to success. The Belete potato varieties distributed by the project fulfil most of farmers' interest and their production objectives and that is why it became successful. Therefore, the food and income security of poorest and marginalized people could be enhanced through accessing poorest household for demand driven better yielding and high valued agricultural technologies (Tables 1 and 2).

Moreover, the project's cluster based technology dissemination and transfer approach played a significant role to easily diffusion of knowledge and practice from one cluster to the other and created a critical mass on disseminated potato technologies. This approach can bridge the research with extension in more interlinked way and accelerate technology transfer between farmers. In addition, most of farmers prefers to plant potato as intercropping rather than mono cropping. Their preference varies with the primary objective of farmers. Farmers whose primary objective is for household consumption and have land shortage tends to cultivate as intercropping while farmers with their primary objective for cash tends to cultivate as mono-cropping (Table 3).

Interpretation of Linear Regression Result

The study used Simple linear regression model for sorting out factors that affect income earned from improved potato disseminated to small scale farmers in the district. Eight explanatory variables were identified and regressed over amount of income earned from selling improved

Figure 1: Potato yield collected at household level within 9 m^2.

Trt no	Trts NPS kg/ha	Plant height/cm				No of tubers per plant				Potato yield /3 m² (3 × 3 m) (kg/plot)				Potato yield/plot		Total yield qu/ha
		1	2	3	Avr.	1	2	3	Avr.	1	2	3	Avr.	Yield/plot	Yield kg/ha	
1	150	128	92	85	101.7	10	6	12	9.33	29.5	45.8	37.8	37.7	37.7	41888.9	418.88
2	175	72	76	94	80.66	13	13	1	9	22.2	31.5	35.6	29.766	29.766	33073.3	330.73
3	200	102	94	74	90	15	9	8	10.66	32.4	35.2	32.5	33.36	33.36	37066.7	370.66
4	225	102	94	92	96	9	14	9	10.66	41	26.2	24.5	30.56	30.56	33955.6	339.55
5	250	100	84	94	92.66	15	8	13	12	36.7	43	32.7	37.46	37.46	41622.2	416.22
1	150	112	110	110	110.7	16	10	9	11.66	35.2	36.6	48.4	40.06	40.06	44511.1	445.11
2	175	106	114	112	110.7	17	16	14	15.66	28.4	26	33.6	29.33	29.33	32588.9	325.88
3	200	108	114	100	107.3	13	13	20	15.33	27.8	34.2	33.6	31.86	31.86	35400	354
4	225	120	110	118	116	16	15	18	16.33	45.4	34.2	36.8	38.8	38.8	43111.1	431.11
5	250	114	108	114	112	12	15	15	14	30	34.2	39	34.4	34.4	38222.2	382.22
1	150	124	114	100	112.7	27	23	24	24.66	32.8	33.2	33.4	33.13	33.13	36811.1	368.11
2	175	110	112	136	119.3	24	18	26	22.66	31.9	30.5	28.6	30.33	30.33	33700	337
3	200	120	98	118	112	8	14	8	10	45.6	32	31.3	36.3	36.3	40333.3	403.33
4	225	116	114	126	118.7	37	14	9	20	40.8	32	31.3	34.7	34.7	38555.6	385.55
5	250	115	114	110	113	15	10	10	11.66	43.4	33.8	40	39.06	39.06	43400	434
1	150	98	102	100	100	10	9	13	10.66	29.4	27.8	27.2	28.13	28.13	31255.6	312.55
2	175	94	110	90	98	20	15	17	17.33	31	29.2	32	30.73	30.73	34144.4	341.44
3	200	98	110	104	104	18	21	25	21.33	28.8	28.8	21.2	26.26	26.26	29177.8	291.77
4	225	112	96	98	102	13	11	18	14	27.2	32	38	32.4	32.4	36000	360
5	250	114	108	100	107.3	9	22	17	16	22	26.7	25.2	24.63	24.63	27366.7	273.66
Total	4000	2165	2074	2075	2105	317	276	286	292.9	662	653	662.7	658.97	658.97	732185	7321.8
Mean	200	108	104	104	105.2	16	14	14	14.65	33.1	32.6	33.14	32.948	32.948	36609.2	366.09
Source: Field experimentation in Damot Sore Woreda (Abate Abera, 2015).																

Table 1: Effects of different NPS fertilizer rate on potato crop yield and yield components at Damot sore Worenda 2015/16.

potato variety (Dependant variable) disseminated by ORTDP in the district. Explanatory variables used in the model regression comprised of household category (either beneficiary or not), tropical livestock unit, age of respondent, total family size, total land owned in timad (1/4 ha), quantity of potato used, project intervention period/year and quantity of seed reserved as seed. From eight explanatory variables used six were found determinant factors that affected significantly the level of income earned from improved potato adoption comprised of Tropical livestock unit, Being beneficiary or not, family size and intervention period. The study result was in line with Melesse [2] that confirmed access to improved seed affect proportion of the value of potato sold positively.

Household category

Household category was one of the explanatory variables that affect significantly the extent of income earned from improved potato adoption in the district. This variable defined as 1 for improved potato beneficiary farmers and 0 otherwise. The parameter estimates for the independent variable regressed was 14.01. This indicated that being beneficiary farmers of improved potato dissemination increases the level of income earned from the technology utilization by more than fourteen times. Since operational technology dissemination improves awareness of farmers, creates opportunity to avail and utilized improved agricultural packages at full level and supports through follow-up and training, beneficiary farmer's income from improved potato was significantly higher than the non-beneficiary farmers. Through participation in agricultural technology packages, awareness creation and linking the producers to improved agricultural inputs and full package utilization; it is possible to maximize the level of income earned from agriculture.

Tropical Livestock unit

The parameter estimate for the variable Tropical Livestock unit owned is 6.04. This implies that for one unit increase in Tropical Livestock unit owned, the beneficiary farmers income increase by more than 6 Birr, holding all other explanatory variables constant. The size of Tropical Livestock unit reared by farmers is the variable that positively affects extent of income earned from crop farming. Tropical Livestock unit had significant effect on level of income earned from crop farming through its fertilizing that by its own helps crop productivity by decreasing cost of artificial fertilizer accessing. The findings is in inline Esmael et al. [3] that states livestock owned affect farmers extent of potato sales positively affects the extent of potato sales negatively.

Total family size

Family size of a respondent was one of independent variable (continuous variable) supposed to influence extent of income earned from improved potato by beneficiary farmers in the district. Its sign was positive that indicates household with large number of families' size earned grater income from potato that helped the household to weed, earth up, apply fertilizer and use improved agricultural technology packages in comparison to the household with low household size. The regression results confirmed that family size has significant effect in increasing income earned from crop farming for farmers in the area. It looked in to that family size was as such influential factors linked with crop farming that was their main income source and livelihood base. The result is non in line with the finding of Esmael et al. [3]; that justified family size of the household affect negatively the potato market participation and income earned and in line with Urgessa [4] that clarified Labour productivity significantly found as determinant factor of productivity of land and thereby affect income of farmers.

Land owned in timad (1Timad=1/4 ha)

Total land owned by farmers is one of explanatory variable significantly and positively affected the extent of income earned from improved potato adoption to the district. The parameter estimate of the

No.	Name of the farmers	Gender	Commodity	Quantity given	Yield collected	Sold	Income Earned	Consumed in qt	Saved as seed in qt	Kebele	Village	Asset Build
1	Aster Lea	F	Potato	2q	20 qt	15qt*220Birr	Y=3300Birr	3qt	2qt	Sheymaba	Takakacha	Cattle purchase, input purchase for belg(wheat, fertilizer)
2	Assefa Kussa	M	Potato	2qt	23qt	17 qt *235Birr	Y=3995	2qt	4qt	Sheymaba	Takakacha	Purchase of iron sheet for house construction
3	Gashau Abuche	M	Potato	2qt	22	18*250Birr	Y=4500Birr	1	3qt	Sheymaba	Takakacha	Heifer purchase
4	Ukumo Mana	M	Potato	3qt	30	20*240Birr	Y=4800Birr	8qt	2qt	Sheymaba	Takakacha	Ox purchase
5	Mulu Tantu	M	Potato	3	25	15*250Birr	Y=3150Birr	8	2	Sheymaba	Shoomolo	Bull purchase
6	Ayaanu Mamite/ Menta	F	Potato	3qt	22qt	15*210Birr	Y=3750Birr	6qt	1qt	Sheymaba	Shoomolo	Ox purchase
7	Mathwos Altaye	M	Potato	2qt	24	20qt*240Birr	Y=4800	2	2	Shemamba	Takatcha	Bull purchased
8	Gunushe Guffa	F	Potato	3qt	26	17qt*230Birr	Y=3910	4	2	Shemamba	Shomolo	Corrugated iron and window Purchase
9	Bancha Shito	M	Potato	3qt	20	11qt*230Birr	Y=2530	7	2	Shemamba	Shomolo	Purchase Heifer
10	Etagen Birhnu	F	Potato	3qt	25qt	15qt*230Birr	Y=3450	8	2	Shemamba	Takatcha	Purchased heifer
11	Churuko Borko	M	Potato	3qt	27qt	17qt*230Birr	Y=3910	7	3	Shemamba	Shomolo	Purchased ox
12	Abakao Anjulo	M	Potato	3qt	20qt	15qt*230Birr	Y=3450	3	2	Shemamba	Takatcha	
13	Adanech Tame	F	Potato	3qt	28qt	22qt*230Birr	Y=5060	4	2	Shemamba	Takatcha	
15	Mathwos Munea		Potato	3qt	22qt	17qt*230Birr	Y=3910	3	3	Shemamba	Gortchanco	Heifer purchase
16	Amanuel Anjulo		Potato	3qt	22qt	13qt*230Birr	Y=2990	6	3	Shemamba	Gortchancho	Bull purchase
17	Workinesh Nega		Potato	2qt	23qt	18qt *250Birr	Y=4500Birr	3	2	Shemamba	Takatacha	Bull purchase
18	Amanesh Mamo		Potato	2qt	23	20qt *230Birr	Y=4600Birr	3	3	Shemamba		Heifer purchase, Wheat seed and fertilizer purchase
19	Wondimu Shirko		Potato	2qt	16qt	12qt*230Bir	Y=2760Birr	2	2	Doge Anchucho		Calve Purhcase
20	Mengistu Utta		Potato	3qt	27qt	22qt*230Birr	Y=5060Birr			Doge Anchucho	Nazobo	Calve Purhcase and fettilzer and input purchase
21	Marta Godana	F	Potato	2qt	20qt	16qt*230	Y=3680Birr	2	2	Doge Anchucho		Bull Purhcase
22	Wogete Amona	F	Potato	2qt	21qt	18qt*230	Y=4140Birr	2	1	Doge Anchucho		Bull Purhcase and fettilzer and input purchase
23	Fekede Feleha	M	Potato	3qt	26qt	23qt*230	Y=5060Birr	2	1	Doge Anchucho		Heifer Purhcase and fettilzer and input purchase
24	Desta Ossa	M	Potato	3qt	26qt	24qt*230Birr	Y=5520Birr	1	1	Doge Anchucho	Nazibo	Heifer Purhcase and fettilzer and input purchase
25	Demisse Desta	M	Potato	3qt	27qt	25qt*230Birr	Y=5750Birr	1	1	Doge Anchucho	Nazibo	Heifer Purchase and fettilzer and input purchase
26	Asaye Anjulo	M	Potato	3qt	26qt	24qt*230Birr	Y=5520Birr	1	1	Doge Anchucho	Nazibo	Heifer Purchase and fettilzer and input purchase
Source: HH survey and Monitoring and evaluation report 2015/16.												

Table 2: ORTDP potato technology success stories and in their project year of 2014/15 in Damot sore Woreda.

variable land resource owned was 3.11 that imply one unit increase in total land owned results in more than threefold increase in amount of income earned by small scale farmers, holding all the other explanatory variables constant. Since the farmers that acquainted with better land resource size in the district able to manage the resource in a better way, applies the agricultural package over the resource in better manner and consequently more yield and thereby better income than the farmers that owns lesser sized land. The result is not in line with the finding of Regassa [5] that stated income earned from potato negatively correlated with level total land owned.

Amount of potato produced

The parameter estimate for the variable termed quantity of potato produced at household level was 2.19. This indicates that the farming community that produced more potato earned more income in comparison to the household that produced lesser quantity of potato, holding other explanatory variables constant. When small scale farmers able to produce more of potato in quintals, their level of income earned increase parallel., in comparison to the household that produced less. Hence, through enabling resource poor farmers with provision of improved agricultural technology packages, it is possible to make the farmers produce more and thereby increase their earnings.

Project intervention period/year

The coefficients of parameter estimate regressed was -1.64. The regression result confirmed that potato technology intervention result decreased in the project period from 2014 to 2015 due to environmental factors (erratic rain fall). The extent of income earned

No.	Explanatory Variables	Coefficients				
		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	32.81	9.45		3.473	.002*
2	Household category	14.04161	7.99.	0.195	1.757	.093***
3	TLU	6.04	1.78	0.445	3.389	.003*
4	Age	-4.936	12.345	-0.044	-0.4	0.693
5	family size	3.33	0.91	0.428	3.657	.001*
6	total land owned	3.11	0.81	0.462	3.855	.001*
7	quantity of potato consumed at home	2.19	0.81	0.334	2.709	.013**
8	Year of intervention	-1.64	0.47	-0.419	-3.476	0.002
9	amount of seed reserved	1.16	3.11	0.05	0.372	0.714
a. Dependent Variable: income earned from Selling of Improved potato						
Model Summary						
	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	1	.878a	0.771	0.688	1004.466	
a. Predictors: (Constant), amount of seed reserved , age, Household category, quantity of potato consumed at home, family size, total land owned, Year , TLU. The explanatory variables significantly affected income earned at 99%(*),95% (**) and 90% (***) significant level respectively.						

Table 3: Factors affecting level of income earned from improved potato selling in Damot sore Woreda, irish AID ORTDP project, Wolaita Zone.

by beneficiary farmers in 2014 project intervention year exceed 1.64 units in comparison 2015 period. For one unit increase in the year of intervention, the extent of income earned from improved potato dissemination decreased by 1.64 units. The study result indicated that favourable weather condition provokes the level of income earned from crop farming, while unfavourable weather condition worsens.

Conclusion and Recommendation

The Regression analysis result was used to identify the determinant factors of farm and crop income of small-scale farmers. The farm income regression result showed that independent variables such as landholding size, ownership of tropical livestock unit, being beneficiary farmer or not, family size, technology intervention period and amount of potato consumed were statistically significant variables that affected the farm income. This implies that a unit increase of total land owned, tropical livestock unit, and family size increases the farm income of the farmers.

The study results pointed out that through training and awareness creation, adoption improved agricultural technology packages and technical support, it is possible to increase the productivity of crop farming there by optimize the income of small scale farmers.

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