



Commercialization of vegetable production in Alamata Woreda, Northern Ethiopia: Processes and Impact

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Abstract

The Raya valley in Tigray where Alamata Woreda is located, has fertile soil, suitable climate and rich water resources to grow various crops including vegetables. Surface water from seasonal rivers/streams and small dams and ground water extracted from deep and shallow wells with various water lifting devices are the two main sources of water for irrigation in the Woreda. A participatory rural appraisal (PRA) study conducted by the Woreda stakeholders and facilitated by IPMS identified (irrigated) vegetables as a potential marketable commodity in 2005. Using the commodity value chain approach, production, input supply and marketing problems and opportunities were identified. Major problems were lack of interest partly as a result of market failure in the past, lack of agronomic and irrigation knowledge and skills resulting in lack of use of advanced agronomic inputs (e.g. seeds) and underutilization of modern irrigation facilities (most of the deep wells established were not used and/or underutilized).

Different extension approaches were used including study tours to change the mind-set and to acquire knowledge for experts and farmers. Following various production interventions, market linkages were created which resulted in better prices (from 0.70Birr/kg before 2005 to 3-5Birr/kg in the following years). Farmer to farmer communications, trainings, workshops and media coverage facilitated the further dissemination of knowledge and skills between PAs in Alamata and neighboring Woredas. As a result of these interventions, the area of irrigated onion, pepper and tomato tripled in size from 351 ha in 2004/05 to 1113 ha in 2008/09. The lion share of this increase was due to a ten fold increase in onion area from 84 ha in 2004/05 to 824 ha in 2008/09. Most of this increase took place in the spate irrigated areas where plots previously used for cereal crops (sorghum and teff) were converted to vegetables. Both women and men farmers benefited from the intervention. Many farmers managed to construct houses in town and were able to own different assets. The further expansion of the (irrigated) vegetable production in Alamata is feasible. However, more attention needs to be paid to improving productivity, especially in the spate irrigated areas since no clear evidence was found that area increase was accompanied by productivity increase, indicating lack of adequate institutional and farmers' knowledge and skills. Also adverse weather conditions during the 2008 harvesting season, resulted in considerable crop spoilage and lower prices – indicating the risk associated with this commodity under rain-fed conditions. Finally, potential salinity problems should also be taken into account.

Keywords: extension, innovation systems, onion, market, tomato

1. Introduction

The IPMS project, funded by the Canadian International Development Agency, was established to assist the Ministry of Agriculture and Rural Development in the transformation of smallholder farmers from a predominantly subsistence oriented agriculture to a more market (commercial) oriented agriculture.

The project adopted a 'participatory market oriented commodity value chain development' approach which is based on the concepts of innovation systems and value chains. Crucial elements in the approach are the focus on all the value chain components instead of only a production technology focus; the linking and capacitating of value chain partners and the assessment, and synthesis and sharing of knowledge among the partners.

The project introduced this approach in 10 Pilot Learning Woredas (PLW) in Ethiopia with the objective of testing/adopting the approach so that it can be promoted nation wide. An integral part of the approach is the identification of marketable commodities and the value chain constraints and interventions. This was accomplished through a participatory process in all PLWs

This case study focuses on the development of irrigated vegetables in Alamata Woreda with the objectives of documenting diagnostic results and value chain interventions, and providing proof of concept, challenges and lessons learned to be considered for scaling out.

Following the introductory section, the remaining sections are structured as follows. Section two deals with methods and approaches used in the study, while section three presents background information, including description of the PLW and the history and diagnosis of irrigated vegetable development. In section four, value chain interventions - extension, production, input supply, marketing, and credit issues - are presented. Section five dwells on results and discussion on production/income, input supply/marketing, gender/environment/labour use, organizational and institutional aspects, while sections six and seven deal with challenges and lessons learned, respectively.

2. Methods and approaches

To start the development of a commodity, IPMS used a district level participatory market oriented value chain planning approach, aimed at identifying (i) main farming systems, (ii) potential marketable crop and livestock commodities at farming system level, (iii) constraints, potentials and interventions for each value chain component, and (iv) value chain stakeholder assessment with potential (new) roles and linkages. Different value chain stakeholders were involved and consulted in this planning exercise. Secondary biophysical and socio economic data were collected, followed by open ended interviews with focus groups and key stakeholders. The results were presented in a stakeholder workshop in which

priority marketable commodities were decided upon together with key intervention areas and partners.

This initial rapid assessment was followed by some more detailed studies on selected commodities. Such studies were conducted by partner institutions and/or students and/or IPMS staff using formal surveys, interviews and observations.

To implement the program at Woreda, Peasant Association (PA), and community levels, the project facilitated different knowledge management and capacity development approaches and methods to stimulate the introduction of the value chain interventions by the actors concerned. The various value chain interventions are documented by the project staff in the six monthly progress reports (www.ipms-ethiopia.org) and the annual Monitoring and Evaluation (M&E) reports.

To quantify the results from individual and/or combination of interventions, the project established a baseline and measured/documentated changes. Several data sources were used to establish the baseline and to document changes and results.

2.1. Baseline information

To establish a baseline, data from a formal baseline study and data from some special diagnostic studies were used. The initial PRA study also contributed to the quantitative and qualitative baseline information.

Amongst others, the formal baseline study used PA level interviews and records to collect information on irrigated area coverage and the number of households involved in irrigated agriculture. This information was used to compile district level information on irrigated acreage by crop and households.

2.2. Documenting change processes and results

Several sources were used for regular documentation of change processes and results, including six monthly progress reports, annual M&E reports, MSc thesis research, records kept by the OoARD, personal observations and diaries. In some PLWs, staff also monitored changes in production/productivity for a few selected farmers on a regular basis.

In 2009, the project also developed a set of guidelines for the PLW staff to systematically collect relevant information for the case studies including history, changes in extension services, value chain interventions (production, input supply, marketing and credit), results, challenges and lessons learned. Part of the information was obtained from the previously mentioned baseline and other sources and specially arranged key informant interviews, a commodity stakeholder workshop and a household level survey. The stakeholder meeting

was organized to establish the evolution of the roles and linkages of the value chain actors.

In Alamata, all the eight PAs (Kulugize Lemlem, Selam Bekalsi, Limat, Tumuga, Selem Weha, Tao, Laelay Dayu, Gerjele) targeted by IPMS for market development were included in the formal household survey conducted in 2009. The survey data consists of relevant production and marketing information on vegetables including area allocation, production costs and inputs use, level of production, and marketed surplus. In selecting the sample households, with the aim of getting some idea about the effect of the different interventions, a distinction was made between households who had adopted/benefited from the various interventions and households who did not. In both sample groups, both wealth and gender criteria were considered to get a representative distribution of sample households.

A follow up discussion was also made based on observed changes in the number of newly built houses in Gerjele. Based on this discussion, a simple assessment was made to see the direct contribution of vegetables production by identifying the source of farmers' income in building these new houses. There are a total of 125 houses along the main road at Gerjele PA, but only houses built since 2007 were considered. This associates the construction of the houses with IPMS intervention, which commenced in 2005.

Following the collection of all relevant information, a write-shop was organized to present information in a systematic manner. Drafts of the PLW specific commodity case studies were then reviewed by experts at the IPMS Head Quarter.

3. Background to irrigated vegetable development

3.1. PLW description

Alamata is located 600km North of Addis Ababa. It is the most Southern Woreda of the Tigray Region and borders with Amhara Region from the South and West, and Afar Region from the East. There are 10 peasant associations and two town dwellers associations in the Woreda. The total population of the Woreda was 128,872 while the number of agricultural households was 17,597 in 2003/04. Altitude in the area ranges from 1178 to 3148 meters above sea level (masl) and 75% of the Woreda is lowland (1500 masl or below) and only 25% is found in intermediate highlands and highlands falling between 1500 and 3148 masl. The small undulating mountains surrounding the Woreda are very steep and with low vegetation cover. The mountains surrounding Alamata cover a large area and have a series of dissected gullies which serve as a source of runoff water to the Alamata valley. The gullies join together and form seasonal rivers down the foot of the mountains. The dissected channels slowly spread over the valley depositing silts and water down to the valley. The fine silt is relatively fertile and the water becomes a source of supplementary irrigation. The Alamata valley is

one of the most agriculturally potential areas in the region. Farmers in the woreda extensively cultivate cereals and vegetables. They also raise mainly sheep and cattle in the valley.

According to the digital data available, Eutric Vertisols, Lithic Leptosols (Cambic) and Lithic Leptosols (Orthic) are the soil types covering nearly 100% of the land in the Woreda. Soil pH for profiles tested by Relief Society of Tigray (REST) from the valley bottoms indicate that it ranges from 7.4 to 8.5 and is reported to increase with depth (REST, 1998). Traditionally, soils on the plains are believed to be fertile because of the silt coming from the adjacent mountains. However, previous studies by the Raya Valley Project indicate that soil fertility in this valley is low. Field observations demonstrated that the soils in some areas indicated salinisation problems and needed careful reassessment of the area (IPMS, 2005; Makombe and Prasad, 2006).

Rainfall is usually intense, short duration and unreliable. The average annual rainfall recorded for 8 years (1995 to 2002) was 831 mm/yr. Alamata experiences bimodal rainfall, but since recently the rainfall pattern has drastically changed. The usual main rainy season during July to August now starts at around mid-August and stops soon. As a result of all these, Alamata is one of the 16 drought prone Woredas in the region.

Teff and sorghum are the dominant crops covering around 75% of the Woreda's cultivated land. However, the yield of these crops is very low at about 5 and 7 qt/ha, respectively. Farmers in the area still exercise planting of the long seasoned sorghum but with difficulties of obtaining good harvest. Even if the crop does not fail totally because of the crop's drought tolerance, yield is substantially low. *Parthenium hysterophorus* L. (congress weed) is becoming a major weed in the area, especially in the lowlands of the Woreda. This weed has also been identified as a major weed in the adjacent Kobo Woreda of the Amhara Regional State.

Livestock are integral component of the farming systems. Oxen provide almost the entire traction and threshing power. Despite the large population of livestock, especially cattle and sheep, productivity is low as in many other parts of Ethiopia. Alamata is suitable for small ruminants, both sheep and goat production. Although livestock feed is a major limiting factor in the area, sorghum contributes a significant proportion of the supplementary feed resource.

3.2. History and diagnosis of irrigated vegetables development

Many types of vegetables are grown in Alamata because of the favorable climate and easy access to surface and ground water sources. The Woreda is among the potentially best vegetable production areas in Tigray region. It is considered by the Regional government as a "Development Corridor" where commercial agriculture can develop.

Farmers are traditionally accustomed to directing flood (surface) water for supplementing their crops (spate irrigation). There are as many as eight major sources of flood water, one of which was coming from as far away as Eda Mokeni in Maichew Woreda. Primary, secondary and tertiary irrigation canals have been developed by the Relief Society of Tigray (REST) for trapping flood waters that come from the northern highlands for supplementary irrigation. The Tigray Commission for Water Resources, IFAD (The International Fund for Agricultural Development) and REST also developed a series of 30 ponds that could enable supplementary irrigation for 133 ha in the form of spat irrigation in the Woreda.

Ground water potentials of the Raya Valley, which includes Alamata, has a recharge rate of 85 million cubic meters per year (MCM/yr), a ground water reserve of 7150 MCM/yr and an estimated exploitable ground water resources of about 130 MCM/yr (REST, 1997). These figures indicate that there is high prospect of developing ground water resources in the valley (REST, 1997). Ground water is traditionally extracted with shallow wells which irrigate small areas (about 100 m²). Since the area was targeted for irrigated agricultural development, the Regional Government/REST supported the development of 12 deep wells. Two were ready for use in 2005, however only one was functional (in Limat PA), which was irrigating 20.4 ha of land where different crops, such as onion, tomato, vernonia, and cotton are grown using water from this well. The other one is in Chelekot PA, which was already established in 2000 but started functioning in 2008. In 2005, the operation of the scheme was disrupted because of damage by the community and land was used for cereal cropping. It was also observed that some areas which were previously cultivated were abandoned due to water logging and/or salinity (Makombe and Prasad, 2006).

The culture of growing hot pepper has a longer history in the area. Since 1991 the OoARD and the Raya Valley project have been making efforts to introduce different types of vegetables. Onion production was very limited in the Woreda. Initially, the OoARD produced seedlings in government nursery sites, and experts were teaching farmers how to plant onion by distributing about 300 seedlings per farmer. Farmers who took these seedlings were not convinced that onion was an important crop as it doesn't produce straw like cereals for use as animal feed. Farmers who ventured to produce onion managed to harvest bulbs, but sold it at very low prices of 0.80-1.00Birr/kg in 2004. All farmers who had a plot at the irrigation sites planted onion and hot pepper. Large quantities of onion were produced and most of it was spoiled due to lack of market in 2008. Farmers were discouraged and during the subsequent year all the irrigated area was covered with cereals (sorghum and teff) while vegetable planting was somehow abandoned. The baseline data showed that only 351 ha were covered by vegetables in 2004/05 production year.

IPMS introduced the participatory market oriented commodity value chain approach in Alamata in March 2005. The stakeholders identified vegetable production as one of the marketable commodities. However, the lack of interest

and poor husbandry practices, including water management, use of poor performing varieties, an inadequate input supply system for seeds/seedlings and agrochemicals and low and fluctuating market prices were key bottlenecks for the development of irrigated vegetable. A special problem was the breakdown of recently established deep well irrigation schemes (IPMS, 2005). Furthermore, the institutional support for the development of irrigated horticulture development within the Woreda OoARD was rather poor since only one expert with diploma level knowledge on horticulture was present at the start of the project.

4. Value chain interventions

4.1. Extension services

Because of market failure in the past, farmers' interest in vegetables production was low and the emphasis was, therefore, put on creating a better understanding through experience sharing study tours. From September 2005 – June 2006, two study tours were conducted on market oriented commodity development (see Table 1). As a result of these tours, several farmers took up irrigated vegetables production, especially onion during the 2006/07 season. Success stories of onion production and marketing in 2006/07 were documented and presented during different irrigation conferences, farmers meetings and festivals. Farmer to farmer communication on the benefits gained from onion as compared to cereal crops production spread up to neighboring Raya Azebo Woreda. Onion production expanded dramatically (see result section) using spate irrigation during the rainy season and deep and shallow well irrigation during the dry season. The project also supported in-service training for selected farmers in spate irrigated areas (see Table 1).

The deep well in Chelekot PA, which was damaged by the local community, was maintained using Woreda Administration budget in 2008. In 2007/08 the OoARD and Alamata Woreda Administration passed an order that all irrigated land using a deep well should be covered with vegetables and not with cereals. The project actors therefore focused their attention on the rehabilitation of this scheme using participatory planning methods to develop new user arrangements of this communal water resource.

Scaling out/up knowledge sharing events were arranged by Raya Azebo Woreda (neighboring Woreda) in Mehoni and Southern Zone of Tigray in Maichew (zonal capital). Success stories of IPMS interventions at Alamata were presented during the farmers' conferences and policy makers' meetings in these districts. In Alamata, almost every piece of plot in the irrigated sites was covered with vegetables and farmers shifted more to market oriented thinking.

There was also good media coverage, including Ethiopian Television (ETV) and a local radio station on the onion expansion in Alamata. Also the successful reclamation of the swampy land and transformation into productive farmland was

documented by the Ethiopian Television, local radio station and a national daily newspaper–Addis Zemen (IPMS, 2008).

Besides these various knowledge management and participatory planning activities, the project was also engaged in capacity building activities through in-service trainings, in particular for farmers in the Chelekot scheme. Training was organized and attended by 98 farmers from Chelekot who have 0.20 ha plot each in the Chelekot deep well irrigated scheme. The training focused on vegetables production and irrigation techniques including both drip and sprinkler irrigations.

Table 1. Major vegetable capacity building and knowledge management activities

Date	Type of event	Type of participant				Total number of participants (by gender)		Grand Total
		Public		Farmer		M	F	
		M	F	M	F			
Dec. 13-15,2005	Training	12	2			12	2	14
May 02-03, 2006	Training			14	4	14	4	18
	Study			18	5	18	5	23
May 17-20, 2006	Tour							
June 25-27, 2006	Training				39		39	39
	Study			20	6	20	6	26
June 28, 2006	Tour							
Feb. 17-19, 2007	Training			61	22	61	22	83
October 2008*	Training	13	0	10	3	23	3	26
		12	2	113	76	125	78	203
May 10, 2009	Field day							

Source: IPMS progress reports

*Alamata Agricultural Research Centre

The project also intervened in building the institutional capacity for horticultural development by providing a BSc scholarship in horticulture for the diploma level expert who was working on irrigation in the Woreda.

4.2. Production intervention

Production interventions were introduced respectively in the spate irrigated, deep well, and waterlogged areas. For both spate irrigated areas and deep well irrigation schemes, production interventions focused on the introduction of new varieties like Bombay Red (onion) from Fogera Woreda, while Mareko fana

(pepper) was introduced in 2008/09. Knowledge on seedbed preparation, seedling production, optimum transplanting time and stage of seedling growth, line planting and spacing, irrigation methods, watering frequency, disease and pest control, harvesting stage and storage techniques were also introduced in Alamata.

A study on Chelekot deep well irrigation scheme showed that water discharge for sprinkler and drip irrigation systems can irrigate 2.5 and 6.9mm/hour, respectively (Gill, 2008). Using these results, optimum irrigation schedules for onion, tomato and pepper were calculated using CROPWAT model (decision support system developed by the Land and Water Development Division of FAO for planning and management of irrigation). This model considers the local climate, crops, and soil conditions). An optimum schedule for a year-round productivity was designed, integrating crop rotation and fallow periods for high crop yields. A four day sprinkler irrigation schedule for onion complies with the net irrigation depth and crop root depths, as does the eight day drip irrigation schedule for the tomatoes and peppers. They also require eight hours of irrigation or less, out of a possible 16 hours, even during maximum water usage in order for the rotation to be adopted successfully and to keep the many farmers using the system satisfied (Gill, 2008).

The AARC (Alamata Agricultural Research Centre) has also conducted research to see the performance and seed production aspects of various varieties of onions (Adama red, Bombay Red and Melkam) and tomatoes (Metadel, Bishola, Eshet, Fetan Roma VF and Melka Shola) in Alamata since 2008.

The swampy areas identified during the PRA were used for uncontrolled grazing, but were formerly used as croplands. The Tigray Agricultural Research Institute (TARI), the OoARD/IPMS, Regional Bureau of Agriculture and Rural Development and the Tigray Region Water Resources joined forces to develop the land with the farmers. The land was characterized, sampled and measured spatially oriented soil and water quality, delineated in order to suggest land preparation techniques and in situ drainage. Based on the collected information and relevant secondary data, experts suggested and developed spatially explicit interventions to turn the swampy areas into productive at and environmentally acceptable levels for sustainable production. In 2007, about 600 ha of swampy land in two peasant associations (Gerjele and Timuga PAs) were reclaimed. In the following years reclaiming of the land continued spontaneously and the total reclaimed land has reached to more than 1100 ha by mid 2009. A significant amount of the area has been used for vegetable and field crops production during the dry and wet seasons, respectively. In addition, in collaboration with SUN-GTZ project, various forage species were also tested and performed well on the reclaimed swampy areas. The well performing forage species are Napier grass (*Pennisetum purpureum*) buffel grass, Pannicum grass, cowpeas, and Rhodes grass (*Chloris gayana*) (IPMS, 2007).

4.3. Input supply / service provision

Farmers were using canned imported onion seed. Those packages had ring on the opening of the container. Lately, at the end of 2006 and 2007 similar packages but with no ring, believed to be forged products, were coming in to the market from Addis Ababa by various merchants. Onion produced from the later seed type was found poor in quality and unattractive in the market exhibiting more of yellowish bulb color and less storability. During purchase of onion seed, farmers were struggling to differentiate the types of packaging and gradually lost confidence on the quality of onion seed on the market. This phenomenon made onion growing farmers to insist and look for better quality source of onion seed with acceptable bulb quality for the market.

It is at this junction the project sought an option to find both affordable and better quality onion seed variety that could perform well at Alamata. Accordingly, at the end of 2007, IPMS introduced a sample of onion seed (Bombay red) produced in Fogera (Amhara Region) and provided it to two farmers in two PAs for testing under supplementary and sprinkler irrigation conditions. As a result, good performance (250-280 qt/ha) and quality was demonstrated and witnessed to farmers and Union executives at the spot. The project then facilitated a market linkage between Shewit Union of Alamata and onion seed producers at Fogera, which started supplying seeds for the 2008 planting season. The amount of seeds required were determined through a participatory planning process which involved farmers, PA administration, OoARD staff, IPMS and Woreda Administration.

It was also observed that onion seedling preparation emerged to be a new business especially to women in urban and peri-urban areas, who had small free space and source of water in their compounds.

Alamata Agricultural Research Centre (AARC), through funds from IPMS, was involved in tomato and onion seed production. In 2008, tomato seed production was tested on six varieties (Metadel, Bishola, Eshet, Fetan, Roma VF and Melka Shola) on about 0.4 ha in Tumuga PA by 12 of the farmers who were previously trained by the centre (Table 1). In the same year, onion seed production, using two varieties (Adama and Bombay Red) was tested in the same PA from bulb after vernalisation on four farmers' fields.

4.5. Output marketing

Marketing of onions and pepper was done on an individual basis and farmers in a particular location were faced with usually one buyer for their product. This marketing situation put farmers' bargaining power on prices lower and they have to accept what the buying trader offers in order to avoid loss due to lack of market.

To address this problem in 2006, names and addresses of onion traders in three big towns in Tigray Region (Mekelle, Adigrat and Shire) were identified and communicated to Shewit Multipurpose Union to enable them to provide price information to farmers. The Union also facilitated the bulking of produce of individual farmers in FTCs to attract more buyers. It also assisted farmers by weighing their produce – previously produce was sold by sacks, which varied considerably in weight. While the Union also tried to become a marketing actor itself, in the end it did not buy since traders raised their prices as a result of the intervention of the unions (see results).

In the 2007 rainy season, preparations for organized onion marketing was made. The Woreda Advisory and Learning Committee (WALC) and value chain actors discussed the idea of creating a marketing committee chaired by the head of cooperative department of the OoARD. The committee extended the search for potential buyers in and outside the Region to cope with the increase in produce. The Union, which was part of the committee, continued its role of facilitating between traders and producers.

In 2008 the committee was strengthened by adding new members and the Head of Woreda information desk was nominated to be the chairperson of the committee. Each member of the committee had its own responsibility for organized onion marketing. While most of these roles were of a promotional and linkage nature, the Union also took on a role of active marketing agent involved in the purchase and sale of onions from their account. In order to strengthen the committee, IPMS invited a resource person from Tigray Agricultural Marketing Promotion Agency (TAMPA) in Mekelle, to give training on marketing principles, particularly, in preparation for the onion marketing. A total of 265 participants from Woreda OoARD experts, DAs, farmers and PA administrators participated in the three days training. Later, the OoARD and USAID/REST were also involved in building storage facilities in support of improving marketability of onion in the PLW.

5. Results and discussions

5.1. Area/household coverage, production/productivity and income

The effect of the various interventions in terms of area coverage, production/productivity and income can be assessed both at individual household and at district levels.

Household level data

The household survey conducted in 2009, covering 2007/08 production year compared area covered, production, productivity, cash cost, gross revenue and return to family labour for adopters and non adopters (Table 2).

The table shows that on average, adopters cultivate larger areas of the major crops than non-adopters and have higher gross production values and net returns to family labour. The effect on production is less clear, especially for onions. The fact that none of these parameters are statistically significant indicates that there is considerable variation between farmers in each of these groups.

Household data were also analyzed to determine total production and income from vegetable production (Table 3). These data consider adopter and non-adopters of the intervention approaches.

Table 2. Household production and income from vegetables Alamata (2007/08 season)

Vegetable type	Farmer type	Obs	Av. Plot size (<i>timad</i>)	Av. Production (<i>per household</i>)	Av. Productivity (<i>kg/timad</i>)	Av. Price a) (Birr per kg)	Av. Cost (<i>cash outlay</i>)	Av. Gross revenue	Net return to family labour-b)
Onion	Adopters	25	1.14	1566.1	1518.2	2.85	811.57**	7891.08	7079.51
	Non-adopters	17	0.948	1735.2	1838.3	2.85	356.67	4945.44	4588.76
Tomato	Adopters	4	0.75	3037.5	3325	1.45	751.7	4404.38	3652.68
	Non-adopters	1	0.5	450	900	1.45	22.47	652.50	630.03
Pepper	Adopters	13	1.135*	733.3	236.6	7.34	146.08	5404.48	5244.04
	Non-adopters	11	0.731	416.4	343.8	7.34	46.25	3068.60	3018.46

Note: **, and * are significantly different from the other group mean at 5% and 10%, respectively.

^a Average price received by all households is considered (adopters and non-adopters).

^b Net return to family labour is the difference between gross revenue and cash outlays

Table 3. Household data on vegetable production and income

Farmer type	Obs	Average Area (<i>timad</i>)	Variable costs ^a	Labour (AE)			Average revenue from vegetables production
				Own	Hired	Total	
Adopters	34	1.390**	418.62**	37.9*	18.8**	56.7***	8175.68*
Non-adopters	28	0.966	130.38	30.2	6.0	36.7	3258.89

Note: ^aVariable cost here is the sum of money outlay for seed, fuel, fertilizer and pesticides used for vegetable production per household.

District level data

The following table shows the baseline data for the number of households and areas.

Table 4. Number of households and vegetable overage 2004/05

Land use (Irrigated)	No of HHs producing	Area covered (ha)
Onion	601	84
Pepper	1229	262
Tomato	38	5
Total		351

Source: IPMS baseline survey (2005)- from 8 PAs with vegetables

Data on area and household coverage will be collected by the end of the project. In the meantime OoARD statistics are used to indicate the trends (Table 5)

Table 5. Area data irrigated vegetable production Alamata by year (ha)

Land use	Year			
	2005/06	2006/07	2007/08	2008/09
Onions	122	182	739	824
Pepper	271	220	241	279
Tomato	39	75	94	10
Total	432	477	1074	1113

Source: Alamata OoARD (2009)

As can be seen from these tables (Table 4 and 5), onion area increased by almost 10 times as compared to the baseline situation. Total area of the three main vegetables increased to around three times. Most of this expansion took place in the spate irrigated areas. Deep well irrigation is also increasing and besides the Chelekot and Limat schemes, three more schemes are now operational and irrigating a total of 163.6 ha. In the meantime the government has drilled 30 more deep wells bring the total potential wells to 42. Three of these schemes will become operational in the beginning of 2010 with an irrigation capacity of 357 ha. As a result of these three new irrigation schemes, more than 1500 farmers will be enrolled in vegetable production by 2010.

As a result of scaling up/out, Raya Azebo, the neighbouring Woreda adopted the experiences from Alamata. About 100 hectares were supplied with the improved onion seed from Fogera. One private investor planted about 10 ha of onion and tomato.

It is also observed that these data don't distinguish between vegetables produced during the main rainy season, with the help of spate irrigation, and the dry season with deep well and/or shallow wells/springs. The latter usually produce better yields and fetch higher prices. According to personal observations, outstanding farmers in the deep well irrigation scheme obtained between 8,000 and 13,000 Birr per 0.20 ha plot (single harvest). Productivity of onion was also encouraging, which was about 260-300 quintal per ha as the supervision and technical assistant to farmers by appointed special DAs on irrigation management was more in these schemes in applying improved agronomic practice as compared to the spate and shallow well production systems. Prior to the rehabilitation of the scheme, farmers used the fields for cereal production.

5.1.1. Farmers' income for constructing new houses at Gerjele PA

In the past few years, the Gerjele PA, which is found on the main road from Addis to Mehoni town, exhibited construction of many newly built mud houses with corrugated iron roofs, apart from their traditional housing style which are typical grass thatched tukuls. All 67 farmers who own newly built houses since 2007 were interviewed as to when they built; cost they incurred and source of money for constructing the houses. Out of the 67 farmers, 19 are women and 48 are male farmers. Eight of these farmers had more than one house hence the total number of houses built since 2007 is 77. The cost of constructing a house ranges from Birr 3,240 to 33,860. Results indicate that income from the sale of vegetables was the source for 56 newly built houses by 52 farmers (Table 6). This shows that more than 77% of the farmers who built new houses in Gerjele PA have got money from the sale of vegetables, mainly onions. This is a clear indication on how income earned from vegetable sale is making a difference on the livelihoods of these farmers. The change and progress in their farming practice have also been noticed as irreversible and showed sustainability due to this specific commodity development in the PLW.

Table 6. Data on source of income for newly built houses at Gerjele PA, Alamata PLW

Main source of income for house construction	No of farmers	No of houses built in year			Total houses built
		2007	2008	2009	
Sale of vegetable produce	52	15	27	14	56
Sale of livestock, field crops etc.	7	4	5	2	11
Money sent from relatives (remittance)	8	4	4	2	10
Total	67	23	36	18	77

5.2. Input supply/marketing

5.2.1. Input supply

Following the linkages made between the Fogera onion seed producers and the Shewit Union at Alamata, the Union distributed more than 1600 kg of onion seeds. It is noted however that private merchants also continue to supply seeds. The Union purchases onion seeds at 140Birr/kg and sold it at 150Birr/kg. While the narrow margin (10 Birr/kg) was perhaps beneficial for the farmers, it may not be sufficient for the Cooperative to operate as a commercial enterprise, especially since private traders now sell seeds at 350- 400Birr/kg

Some female headed households who were involved in onion seedling production and reportedly earned 400-500Birr/8m² nursery plot.

From the trials by AARC, on tomato seed production, Metadel performed better than the rest of the varieties, even though there was no statistically significant difference among all four varieties tested. Seed yield ranged between 2.15 to 4.12 qt on a hectare basis. The trial on onion seed yield on the four volunteer farmers was affected due to various diseases and pests but also moisture stress, and hence yield was very low. Despite this however, AARC is continuing to demonstrate the importance of onion seed production in Alamata.

5.2.2. Marketing

In 2006, market interventions by the actors to penetrate the regional market resulted in an increase of the farm-gate price from 0.75 Birr/kg in 2005 to 1.90 Birr/kg in 2006.

In 2007, new market linkages were created with traders from Addis Ababa, Adama and other central parts of the country. The traders were advised that Alamata onions were grown under rain-fed in fertile soil where no fertilizer is applied. Farmers received 2.8–3.0Birr/kg of onion from these traders. It was learned later on that supermarkets labeled it as “Organic Onion from Alamata”. During the same season, farm-gate onion price increased to 5.50Birr/kg. Many farmers benefited from the increase in production and price.

In 2008, the Shewit Alamata Union purchased 160 quintals of onions and created linkage with onion wholesalers in Mekelle, with the help of TAMPA. However, the arrangement did not last long due to inefficiency of the Union in delivering the quantity demanded by the traders. Brokers and middlemen also attempted to sabotage the linkage in order to control the market. A trader from Addis Ababa came to Alamata and met with the Union to sign an agreement for organized marketing. This linkage was also sabotaged by middlemen and brokers. Other linkages with the Defense Force in Debre Zeit were explored with the help of IPMS. Representatives came to Alamata and signed an agreement with the Union for organized collection and delivery. The initial deal of 310 quintal onion was delivered to Debre Zeit and this linkage was expected to function properly.

However this deal was not beneficial to the Union, since they purchased onion at 2.40 Birr/kg from the farmers and had to sell at 2.0 Birr/kg to the Defense force. Furthermore, untimely rain came at the end of October 2008 and spoiled the onion in the field. Some farmers who were not able to preserve their onion from rain faced challenges to sell or dump the product. The rain lasted for about two weeks and spoiled some of the production. Some farmers practiced post harvest techniques by crushing and sun drying and it was sold during the long Orthodox Christian fasting period (February – April). Most farmers who harvested their produce after the rain sold for 3.00-3.20 Birr/kg. In general, many farmers benefited from the onions produced during the 2008 rainy season.

The OoARD and USAID/REST built three storage facilities to increase shelf life of onion in three PAs (Kulu Gize Lemlem, Gerjele and Laalay Dayu).

5.3. Other indirect effects

Onion planting created high demand for hired labour. Wage rate per day increased from Birr 12 to 25 during planting periods. It also triggered different groups of society to participate in different operations. For example, some loaded and unloaded sacks of onion to trucks, while others transported onions to road sides using animal power. As a result of the increased income earned through sale of onions, hotels and cafes also benefited from this activity.

All age groups in the family were busy with different activities during planting. In general, onion production created efficient and effective use of family labour and every member of the household is busy during the main production period.

Women farmers, who were renting out their land and share cropping, managed to plough their plot themselves and plant vegetables. The advantage they realized was that vegetable production lasts only for three months and it needs less power to plough.

5.4. Organizational/institutional arrangements

As compared to the starting point, several actors are now involved in the development of (irrigated) vegetable production in Alamata. Table 7 presents list of actors and the roles they played in the overall development of (irrigated) vegetables production in the Woreda.

Table 7. Main actors and roles in development of (irrigated) vegetable production Alamata.

Actor	Role (changes)
OoARD	<p>Built capacity of famers and provided market information; Built storage facilities to increase shelf life of onion in 2 PAs (Kulu Gize Lemlem and Gerjele)</p> <p>Employs specialized staff to assist in the development of irrigation vegetable development. For example, 2 BSc irrigation experts are currently working and supporting the vegetable commodity development in the deep well irrigation schemes.</p>
BoARD	Provided development policy
TARI	Assist in capacity development and the development of swampy areas. Conducting capacity building of farmers and DAs; and research on the performance of vegetables (tomato and onion) and their seed production aspects through its Alamata Agricultural Research Centre.
Shewit Cooperative	<p>Assist in identifying and marketing of onions</p> <p>Assist in identifying and distribution of improved onion seeds</p>
TAMPA	Identifying markets and provide marketing training
Farmers	<p>Changed land use from low value cereal crop production to high value vegetable</p> <p>Women farmers engaged in production and supply of seedlings</p>
Private traders	<p>Purchase and sell vegetables</p> <p>Supply seeds</p>
Water Authority/REST	Provide infrastructural and organizational support for deep well irrigation schemes
IWMI	Assist in assessing irrigation potential and environmental threats (salinity)
IPMS	Facilitate linkages between actors, provide knowledge assist in market development and document processes and results
Onion marketing committee	Explores new market opportunities
USAID/REST	Built storage facility to increase shelf life of onion in 1 PA (Laalay Dayu)

6. Challenges in the intervention process/approach and recommendations

Challenges which prompt further development of the value chain components to sustain interest and growth include:

- Skills development for production interventions aimed at improving the productivity (planting, pest and disease management, water management) have to be more vigorously pursued by the extension system, especially in the spate irrigated areas. Proper staffing of the OoARD with irrigation and horticulture expertise is required to achieve such productivity increases as demonstrated in the deep well schemes because two irrigation experts will not be sufficient.
- Future production problems caused by salinity as indicated by the IWMI study have to receive attention, including alternative use of some of the land. The testing of fodder species in some of the reclaimed swampy lands are efforts aimed at supporting this development.
- The role of the Union in the supply of seeds is commendable, but needs to be based on proper business principles. Sale of agrochemicals and other inputs can also be considered by the Union.
- The marketing role of the Union needs to be clarified. While it was successful in its role as facilitator between producers and traders in the first years, its role as active market participant in 2008 was not. To play such a role, the Union should be properly staffed/capacitated.
- Crop insurance schemes to mitigate climate related risks may also need to be considered.
- With the expanding irrigated areas, long term contractual market arrangements with buyers outside the Region should be considered

7. Lessons learned

- Irrigated vegetable production has benefited the farm population in Alamata in terms of income, which was on average Birr 8,000 for farmers participating in the various onion production.
- Study tours and other knowledge management events contributed significantly to the expansion of the irrigated vegetable production system in and outside the District.
- The use of the value chain approach for the development of irrigated vegetables, in particular, addressing marketing problems has encouraged the expansion of the irrigated vegetable production. Just telling farmers to change from cereals to vegetables is not enough.

- Diversifying and opening new market channels and parties is not without risk as it is obviously interfering with existing marketing structure (channels) and conduct. Involving local level and middle men into the value chain development discussions is crucial to avoid major conflicts.
- AARC has demonstrated that seed production for tomato and onion for sustainable input supply system is possible under the conditions of Alamata but with sufficient capacity building efforts.

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