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FOOD SECTOR TRANSFORMATION AND STANDARDS IN ZAMBIA: SMALLHOLDER FARMER PARTICIPATION IN THE TOMATO SECTOR

RAISE SPS DIAGNOSTIC REPORT # 40

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1. INTRODUCTION

Since 1991, the Government of Zambia has liberalized its markets leading to fundamental structural change in the agri-food sector. Parastatal companies were privatized, commodity markets were deregulated and foreign direct investment (FDI) was both encouraged and facilitated (Saasa 1996). This resulted in new investments by international firms in some sectors of the country's agri-food system, most notably in retail distribution and food processing. These companies introduced modern procurement strategies that have started to change the institutional, organizational and technological characteristics of the supply chain. In these modern supply chains, relationships have a more "contract"-like nature implying both new benefits (price and volume stability) and new challenges (quality and food safety standards, year-round supply).

Various recent studies have provided anecdotal evidence of the impact of this food system modernization process on smallholder farmers in Zambia. See for example Haantuba (2003) and Emongor et al. (2004) for the impact on smallholder producers of the rise of supermarkets in Zambia's in fresh markets or Coulter (2002) for the direct and indirect effects on smallholder producers of warehouse receipt systems in grain markets.

However, little work has been done in terms analyzing the impact of the modernization process in Zambia based on detailed, farm-household level survey work. Recent survey-based studies from other countries, just a few years ahead of Zambia in this structural transformation process, provided mixed evidence. Most studies showed that modernization has for the greater part benefited only a small group of high-capacity suppliers and largely excluded smallholder producers (Neven et al. 2006, Reardon and Berdegue 2002, Dolan and Humphrey 2000). On the other hand, some studies indicated that FDI-induced modernization can have positive vertical spillover effects of smallholder farmers (Dries and Swinnen 2004, Key and Runsten 1999).

This paper contributes to the literature on the farm-level impact of the current wave of food sector modernization in developing countries. The research questions, upon which this paper focuses, are: (1) *what is the nature of this food sector modernization, in particular with respect to standards*; and (2) *who are the farmers that have responded to the new market opportunity created by the rise of supermarkets in Zambia (taking the case of tomatoes)?* The analysis presented here is based primarily on interviews with key informants in the private, public and non-governmental sector and on unique data from a survey of 93 tomato producers.

This paper is structured as follows. In the next section, we present an overview of the changing nature of the tomato sub-sector in Zambia. Section three briefly discusses the changing nature and role of standards in Zambia's tomato sector. Section four discusses our survey data and analytical findings. Section five summarizes, concludes and provides some recommendations for development programs.

2. THE MODERNIZATION OF ZAMBIA'S TOMATO SECTOR

2.1 PRODUCTION

Given its prominence in the Zambian diet, tomato production in Zambia is widespread, taking place at three types of farms: (1) small-scale producers who have on average a landholding of up to five hectares, (2) medium-scale producers (sometimes referred to as emergent producers) with landholdings between 5-20 hectares and (3) large commercial producers who own more than 20 hectares of land. Around 50% of tomato production originates from the Central Province, while significant additional supplies are coming from the Copperbelt and Eastern Provinces. Northern Province has a large number of suppliers, but most of them are small producers. In 2004, the value of tomato production was estimated at around 24,000 tons valued at US\$2 million (Kirsten, 2004)¹.

For the majority of the small and medium-size producers, tomato production technologies are still very traditional. In a recent study of tomato growers in Zambia, Katujongua found that most of the farmers rely on labor-intensive techniques for production, transportation and handling. In the study, it was found that 85% of respondents use bicycles as a means of transportation and 90% use family labor. Simple tools such as hoes and animal drawn ploughs are used in production. The study also found that most of the tomato growers use treadle pumps for irrigation, which was attributed to fact that the majority of respondents received some form of technical assistance from NGOs that introduced treadle pumps at subsidized prices. Tomato producers, especially smallholder growers, experience various production side challenges, including limited access to quality seed, fertilizers, and pesticides, the high costs of these inputs and the widespread lack of knowledge on how to use these inputs.

2.2 MARKETING

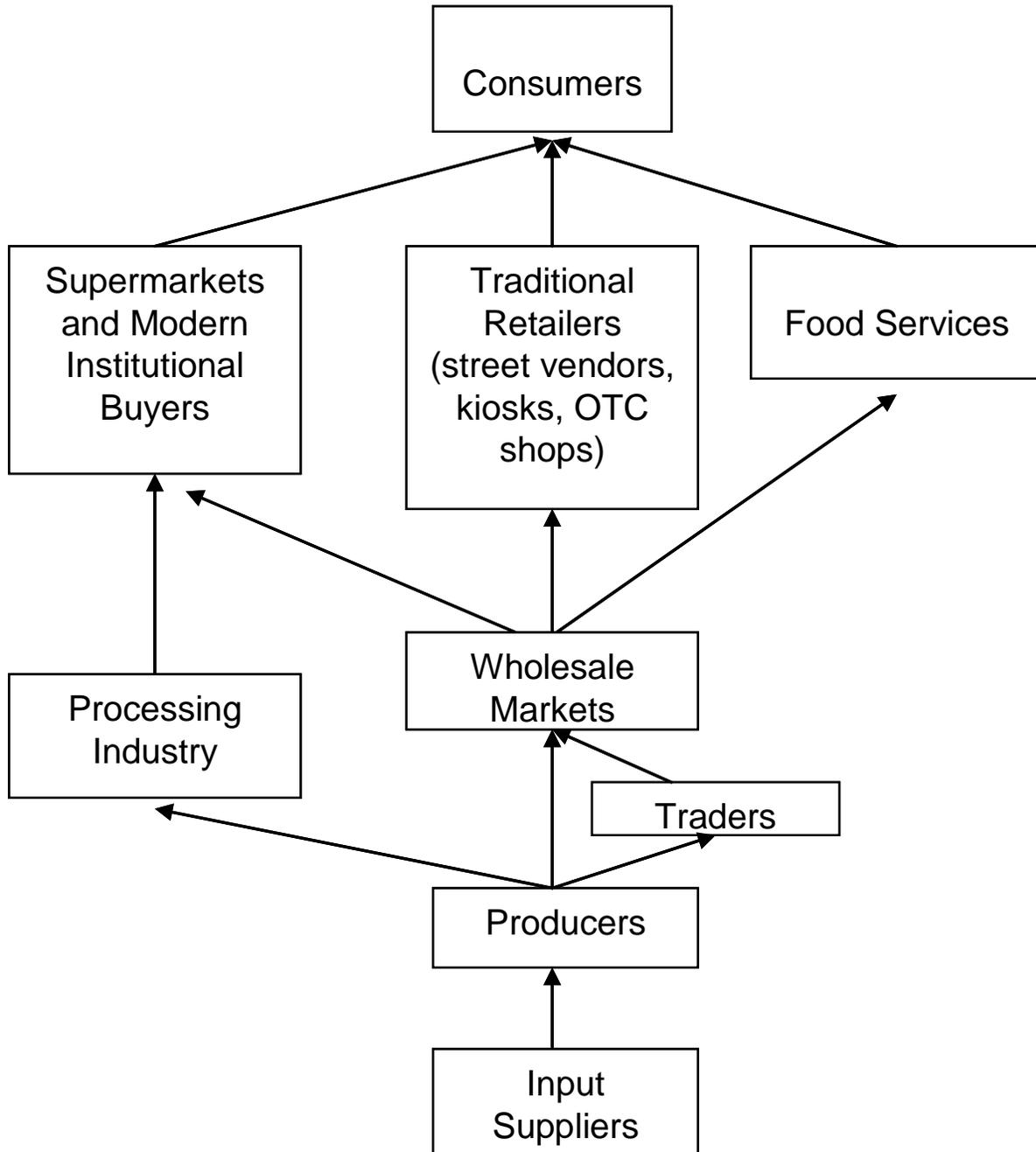
Tomato producers in Zambia sell their tomatoes through three main channels: (1) the open market channel, (2) the supermarket and other modern institutions (e.g., hotels) channel, and (3) the processing industry channel (figure 1). The export channel for fresh tomatoes has been small, with values of less than US\$40,000 being exported (FAO, 2004). Tomato prices vary by season and other demand and supply side factors. Prices are highest during the rainy season (December- April) when supply is low due to high prevalence of crop disease. Prices decline during the dry season (May- November) because of higher production levels.

Prices are predominantly determined at the Soweto market. Whenever there is truck from Mkushi, prices generally fall due a flood of tomatoes in the market. The peak prices (April) can be up to 10 times the price when Soweto is flooded with tomatoes. Typically supermarkets like Shoprite add a mark-up price (of around 10%) to the selling price at the open market. Traders make a usually take a

¹ We used the following exchange rate in this paper: 1US\$ =3,530 ZMK - Zambian Kwacha.

small fixed commission per crate, but when prices are high, they charge a 10% commission. However, the difference between the farm gate prices and what traders sell for can be much higher especially for producers located far from the market.

FIGURE 1: MAIN TOMATO SUPPLY CHAINS IN ZAMBIA



2.3 OPEN MARKET CHANNEL-TRADITIONAL PICTURE

The open market channel, or traditional channel, is by far the most significant channel for tomato producers, with an estimated 80% of fresh tomatoes being traded through this channel. However, serious structural problems exist in the traditional marketing system, due to a lack of investment and weak management at the markets. While almost every city has an open market, the largest and most dynamic open market is the Soweto market in Lusaka. Tomatoes delivered at this market predominantly come from Mkushi and the Lusaka area. Most (60-80%) of the Lusaka tomato supplies used to come from Mkushi, but these growers shifted to other crops and now at least 50-60% of tomato supplies come from within 50km of Lusaka. Two thirds to three quarters of tomato supplies to Lusaka (Soweto) come from smallholder suppliers with farms in the 5-10 acres range. Around 80-90% of supplies of tomatoes to Lusaka come through Soweto market.

Producers generally transport their tomatoes to the market and negotiate for prices. Some producers lacking means of transportation sell tomatoes along the road to traders. Others are located so far from the road, like producers in Mapanza, that they rely on traders to pick up the produce or otherwise they simply rely on the local institutions such as a hospital or a boarding school. Bicycles are the main means of transportation for the majority of small producers. This takes longer to get to the market and limits the quantity that can be carried. Others hire a van or a donkey cart to transport their tomatoes. Tomatoes at the open markets are bought mainly by women marketers who sell them to street vendors, hawkers and small shops and consumers. Some traders buy tomatoes from producers at the open market and sell directly to supermarkets like Melissa. Tomatoes of all qualities are sold in the open market, making this channel accessible to all producers, but transaction costs and price risks are quite high.

Grades in the traditional system refer to size, being free of blemishes, etc. Pesticide residue is not a problem as the women traders clean the tomatoes before selling them. Sometimes one can see the white powder residue from chemicals like dithane. This may be there even if the 3-day pre-harvest interval was respected and is supposed to be not harmful for human health. Traditional retailers are in the last 10 years increasingly focused on adding value by sorting, washing, and packaging, - especially in certain, higher income consumer markets. The main driver for this change is the increased competition, not so much from supermarkets, but for increasing numbers of traditional retailers (higher unemployment today than 10 years ago, more people trying to make a living by selling food).

Tomato production is only interesting if you can produce during the rainy season, because then production is low due to moisture-related diseases. Small-scale farmers are not good in avoiding diseases, they will risk planting the capital-intensive tomatoes (need fertilizer) only when it is easiest to grow (after the rainy season). However, there are some smallholder producers (0-5 ha) who are skilled and capitalized enough to implement a good spraying program. They are also using a new nematode resistant, long-life tomato variety from Israel.

2.4 SUPERMARKET CHANNEL MODERNIZATION

Supermarkets have become more visible with the entry of large South African chains like Shoprite and Spar in the Zambian market. One study (Hichaambwa and Tschirley 2006) estimates that supermarkets account for 14-21% of the produce market in Zambia. Quality requirements and product specifications for tomatoes in this channel are far more stringent and specific. About 70% of small producers supplying tomatoes directly to supermarkets receive some technical assistance and belong to an association. Medium-size producers who supply supermarkets use their own trucks to deliver directly to the store. Producers indicated that prices in the supermarket channel tend to be more uniform. In smaller towns where the local open market is not as dynamic, supermarkets offer an additional channel to producers. Many producers in the Luangeni project, which aimed at linking smallholder vegetable growers to supermarkets in Zambia, indicated that they are better off in terms of total income when they are able to sell their tomatoes and other produce to the supermarkets. While quality requirements are more challenging to meet, the supermarket channel offers a market opportunity for producers who can participate more actively if they organize themselves as a well-organized producer association. In this early stage of the development of produce supply chains to supermarkets, most producers who sell into the supermarket channel, also sell to traditional buyers, in order to spread their market risk.

The most important specialized wholesaler in the supermarket produce supply chain is Freshmark, a wholly owned subsidiary of Shoprite. Two years ago Freshmark had 12-15 tomato suppliers, but vendor rationalization reduced this to 8 in 2005 (the least regular suppliers were removed or those who could not supply the required quality). Freshmark wants to bring this number further down to 4-5 (less is too risky; more is too costly in transaction costs). The farmers have over the last year always been able to supply tomatoes, so there is a decreasing need for Freshmark to buy from marketers at Soweto.

2.5 PROCESSING CHANNELS: A GROWING OPPORTUNITY

Although this paper focuses on the comparison between modern and traditional supply chains for fresh tomatoes, it is important to include the processing supply chain because its growth is potentially linked to the growth of modern supermarkets. Approximately 15% of all tomatoes produced in Zambia are bought by processing companies, most notably Rivonia and Freshpikt.

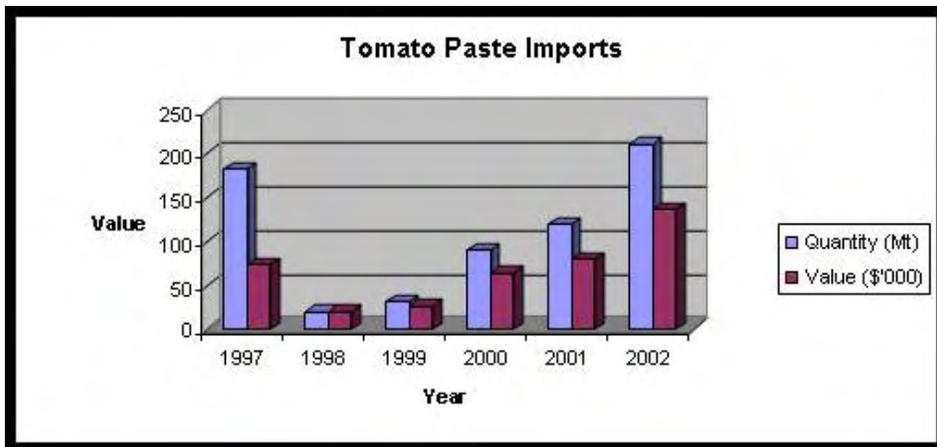
Rivonia is an old established company and the main supplier of tomato paste and ketchup products in Zambia (widely available). It is nevertheless a small company (based in Lusaka). Rivonia used to buy fresh tomatoes for the sauces, but cannot find them anymore at the maximum price they can afford to pay without going out of business. Given that some commercial producers at greater distance from Lusaka (Soweto market) have stopped producing tomatoes (transport made it too costly relative to new producers closer to Lusaka and relative to more profitable products they could grow, such as flowers and that tomatoes sell for higher prices at Soweto, the company can't find tomatoes at an economical price. In order to stay in business, they had to shift to tomato paste imported from China. Currently they only buy tomatoes from a small group of farmers for their chutneys. When they used to buy tomatoes it was in the order of magnitude of 1MT every two days. They tried to go to the farmers and collect the tomatoes directly but all kinds of problems (trucks breaking down, small

volumes and scattered farmers increasing transportation costs, other traders buying the tomatoes before they get to the farm) have stopped them from continuing with this.

The only other main tomato processor in Zambia is Freshpik which began operations as a canning plant in December 2005, after having bought out defunct Zamhort facilities. The company planned to go to 60 ton per week, on an installed capacity of 80 tons of tomatoes per week. They plan to have a mixture of contracted commercial farmers, smallholder farmers and purchases from the traditional market in Lusaka. Their mainly target the domestic market.

The processing industry usually prefers very ripe tomatoes and buys more than 50% of its supply from large producers. Value-adding capacity in the tomato sub-sector still lags behind other countries such as South Africa in terms quality and variety of processed tomato products. Given the widespread production of tomatoes, the development of a tomato processing sector could enhance market opportunities for the thousands of households engaged tomato production. The expansion of supermarkets was expected to stimulate this industry, but low product quality, high packaging costs, limited management capacity in production and post-harvest handling, and the competitive priced tomato products from neighboring countries continue to pose challenges to the growth potential of this sector. Figure 2 below indicates that imports of cheap tomato paste have increased sharply in the early 2000s, as processors shifted away from buying tomatoes locally. Although local ketchup brands are given equal shelf space in supermarkets, there are usually also a couple of high quality and competitively priced imported brands.

FIGURE 2: TOMATO PASTE IMPORTS IN ZAMBIA



Other value-adding processing activities like dried tomatoes are very limited in Zambia. Although tomatoes are predominantly consumed fresh, there is big potential for dried tomatoes for commercial food industries involved in products such as packaged soups or pizza in the domestic or export markets. Notwithstanding these apparent opportunities, Zambia's public and private sectors have not made any significant investments in dried vegetable processing capacity. Currently, tomatoes are typically only dried when producers both small and large fail to market products. There currently is only one (small scale) project, in Chankwankwa, which is involved in drying Roma tomatoes. Drying tomatoes can be done using very simple technologies. Small tomato producers can easily participate in such ventures, but would have to change their tomato varieties to more plum varieties like Roma.

3. THE CHANGING ROLE OF STANDARDS

A Changing Public Standards System Geared Toward Trade and A Weakly Enforced Public Standards Development Driven by Trade Liberalization Which Resulted in a Shift From Non-Technical to Technical Barriers to Trade

over recent decades, trade in high-value and value-added food products has expanded as a result of changing consumer tastes and advances in production, transportation, and other supply chain technologies. Trade in these products is governed by a growing array of standards related to the products themselves and to the processes by which they are produced and handled. The proliferation of standards in developed countries is occurring both at the public level (i.e. Codex Alimentarius, regional trade agreements) and at the private level (through supply chain requirements and in response to the demands of consumer and other civil society organizations). It is being driven by a combination of factors including health and other public policy concerns, scientific advances, consumer preferences, and strategic commercial interests. Developing countries however are experiencing a delay in implementing their own standards and often find themselves in a weaker position in international trade because they do not comply with international food and safety standards.

Although Zambia's Legislative Framework for SPS is Adequate, its Enforcement and Knowledge Support Systems are Weak at Best

Zambia is experiencing some success in expanding its exports of several types of high-value/value added food products. Nevertheless, the proliferation of ever stricter product and process standards poses challenges for Zambia in meeting international obligations, and in enhancing private and public capacities to cost-effectively meet external regulatory or supply chain requirements. Yet, standards may play a catalytic developmental role, stimulating new investments, enhancing the sustainability of production systems, improving worker and consumer welfare, and fostering improved public-private collaboration. It is important to recognize that there are wide differences in the actual application and enforcement of official and private requirements in the different markets and varying degrees of difficulty in actually attaining compliance with these requirements. Zambia exports very little food (other than sugar) and is a large net importer of food. The Zambia's food processing industry is largely not internationally competitive. Its processed food exports are directed at the DRC and other neighboring countries where prevailing official and private standards are similar to those in Zambia. Trading partners from more developed countries like the U.K., Holland and the US are less likely to have confidence in official Zambian positions regarding the enforcement of standards related to for example pest management and the integrity of phytosanitary control.

The Specific Situation for Tomato

The tomatoes from the Soweto market are usually sold by women, who go around on the streets, or maybe have kiosks in front of their house or at open-air markets in residential areas. These women grade on appearance and they usually wash their tomatoes before they sell them. This is not for phytosanitary reasons, but to increase their appearance appeal. Next to buying at the Soweto market,

the women-traders have also started to buy directly from the farmers, when they notice a drop in price at the Soweto market. They are able to travel within a 10-15 km radius around Lusaka, where they personally select the tomatoes. A couple of criteria/standards they use for picking the right tomato include: (1) the degree of ripeness by visual appearance and touch; (2) the degree of presence of bruises; and (3) quality-related, the size, weight and color of the tomatoes. There are many advantages to buying tomatoes at the farm. The traders get more tomatoes per crate (the crates are filled to a higher level compared to crates at Soweto market). Typically, tomato crates weigh 20 kg at the wholesale/retail level and 25 kg at the farm level. The women are also more able to bargain for off-the farm prices. The city wholesale markets have minimal standards of hygiene, and there is no minimum consumer quality standard that is enforced.

A Changing but Largely Ineffective Public Food Safety Standards System

There is basically no effective public food safety standard system for the horticulture sector and even less so for the tomato sub-sector. Nevertheless, there are standards on pesticide use (e.g., regarding pre-harvest intervals). Inspections are very limited. Tomatoes from Soweto market and imported and exported plants, for example, are inspected by the Plant Quarantine and Phytosanitary Service (PQPS) who has the authority to condemn a load if pesticide residues make it unfit for human consumption. The problem is that PQPS does not have a truck to take the condemned produce away for disposal. So they give warnings and basically can only do something if they can intercept the truck before it unloads. All these actions are rather impractical, so it does not happen often. The alternative strategy is to make farmers through extension more conscious of pesticide use and residues.

Zambia has some relevant institutions such as the National Plant Protection Organization (NPPO) and the mentioned PQPS within the Ministry of Agriculture (MACO). These institutions regulate and manage the sanitary and phytosanitary issues (SPS). A recent evaluation done by the World Bank (Jaffee 2006) concluded that certain functions performed by the PQPS are performed adequately. Furthermore, recently drafted legislation will bring Zambia's phytosanitary laws in conformity with the International Plant Protection Convention (IPPC). However, there were a lot of shortcomings in phytosanitary information generation and reporting. There is practically no information dissemination within Zambia related to regulated pests and there is a lack of effective surveillance and up-to-date pest lists, together with minimal capacities to carry out pests risk analysis and control. Field and border post operations are constrained by insufficient staff training, absence of updated manuals and lack of effective transport. A poor pay structure and lack of incentives makes it difficult to recruit and retain capable and motivated staff.

The Emergence of Private Standards in the Tomato Industry

Private standard development differs widely across Zambia's agri-food industry. Not satisfied with the level of standards provided by the public sector, some private firms developed, implemented and enforced their own set of standards. We can distinguish between two types of supermarkets in Zambia: locally owned and operated stores, and stores owned by multinational food retail corporations. One key distinction between these two types is that local stores can be found almost entirely at the lower end of the size definition, while the corporate stores tend to be much larger. Two types of information are critical in understanding the implications of the entrance of corporate chains into Zambia's food system: (a) the extent to which they are or will be able to implement new (modern) procurement systems for fresh produce, thereby bypassing traditional channels, and (b) the rate at which they are likely to grow their market share in fresh produce. If supermarket chains have

only limited success in implementing their preferred buyer programs, or if they implement these extensively but are unable to rapidly grow their market share in fresh produce, their impact on the food systems in which they operate will remain limited.

However, for the tomato sub-sector, two main points must be made regarding private standards. First, supermarket chain standards relate mostly to the packaging (attractiveness, expiration dates and other labeling requirements, volume) and visual appearance rather than to food safety. Tomatoes are graded in the supermarket channel based on size and the absence of blemishes. There is no testing for pesticide residues. Also, farmers do not necessarily get a better price from the supermarket, but rather a secured average market price. In fact, in our survey (described below) we found no statistically significant difference in terms of the price received by the two farmers in the two channels (but our analysis was rather rudimentary).

4. EMPIRICAL EVIDENCE

4.1. DATA

We decided to focus on tomato growers targeting Lusaka because this is where supermarkets and up-scale hotels and restaurants are mostly concentrated and thus where we have the strongest representation of the modern tomato marketing channel. It also the largest market for the traditional channels.

For the traditional channel, in order to put some practical boundaries in place, we selected as the population all the tomato growers operating within a 50km radius around Lusaka. Our first stage sampling frame was the list of all the standard enumeration areas (SEAs) in this area that on expert basis were designated as tomato production areas or non-tomato production areas. From the list of tomato producing SEAs a sample of 15 was selected with a probability of selection proportional to the number of households in the SEA. In the second stage of this two-stage clustering approach, all household in the SEA were tabulated, with an indication on whether or not they grow tomatoes. From these lists, five farmers were then selected using systematic sampling.

For the modern channel, because there are so few preferred suppliers for tomatoes, our sampling frame included all of the tomato suppliers for the lead supermarket chains and hotels. We tried to interview all of them, so this was a census rather than sample for this population. The small number of farmers in this group (especially taking some non-response into account) implied that we ended up with a sample of only 21 observations in the modern tomato channel.

In the end, 100 farmers were interviewed in August/September 2005, and after data cleaning, 93 observations remained (72 farmers in the traditional channel and 21 farmers in the modern channel). This small sample implies that the data analysis in the next sections should be seen as indicative only. This is especially the case for variables based on the memory of the farmer (rather than metric measurement), such as income and yield.

4.2 DATA ANALYSIS

When we look at production and income related differences between the two farmer groups, two significant differences emerged (Table 1). First, farmers in the modern channel belong to a clearly higher income group. Although not significant statistically, the data indicate that this difference in income is related to getting more income from non-farm sources. Second, modern channel farmers achieve on average a yield that is three times that of tomato farmers in the traditional channel. Having income from other sources than farming probably provides the operating cash to finance the necessary inputs which in part explains the yield difference. Farms in the modern channel are on average twice the size of farms in the traditional channel, although the difference was not statistically significant (larger sub-populations would likely have found a statistically significant difference). These differences in average size were found with two modern farms taken out of the sample because they were plantation size (1,000's of ha) and would have distorted the picture too much.

TABLE 1: PRODUCTION AND INCOME RELATED DIFFERENCES (TRADITIONAL VS. MODERN CHANNEL)

Farm characteristic	Traditional Channel Farmer	Modern Channel Farmer
Income from FFV	44%	32%
Income from farming (FFV excluded)	19%	18%
Income from off-farming	37%	48%
Per capita income (US\$, est.)*	517	2,221
Distance from Soweto Market (km)	33	27
Tomato yield (ton/ha, cycle)***	5.9	18.0
Percentage of yield marketed	81%	82%
Farm size	5.5	11.9

Notes: *=significant at the 10% level, *** significant at the 1% level.

The heads of the farm households are on average of the same age and have the same number of years of experience across the two channels (Table 2). However, this is where the similarities end. Statistically significant differences were found in terms of education of the farmer and of the various members of the household, in terms of the size of the household, in terms of the gender of the head of the household, and in terms of the number of permanent and part-time workers at the farm. Farms in the modern tomato channel are operated by smaller, better educated households who are more likely to be headed by a man and who are supported by far more workers than farms in the traditional tomato channel. This further helps explain the large difference in yield found above. Interestingly, there was no significant difference in terms of the assistance farmers in the two channels received².

TABLE 2: LABOR, HUMAN CAPITAL AND GENDER DIFFERENCES (MODERN VS. TRADITIONAL CHANNEL)

Farm characteristic	Traditional Channel Farmer	Modern Channel Farmer
Age of the head of the household (years)	46.7	46.2
Educational level of head of household (years)***	8.8	12.5
Highest educat. level any hh member (years)***	10.2	13.7
Head's years of experience in farming	13.8	15.2
Size of the household*	6.6	5.4
Number of permanent workers on the farm**	0.9	4.0
Number of part-time workers on the farm**	4.9	7.8
Index of services received 2005 (Index 1-12)	2.4	2.6
Percentage female household heads*	15.3	9.5

Notes: *= significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level.

² Services received refers to an cumulative index value relating to the following 12 elements: technical assistance, training, inputs, credit, farm machinery services, packing/collection, packaging/selection, transportation, quality control, phytosanitary inspection, export certification, produce price info.

Clear differences exist in the physical capital owned by the farmers in the modern and the farmers in the traditional tomato chain (Table 3). Whereas less than 15% of the traditional channel farmers have sprinkler or drip irrigation, a tractor or a pick-up truck, 29% of the modern channel farmers have a tractor, around 40% have drip or sprinkler irrigation and nearly 2/3 have a pick-up truck. The more widespread use of more advanced irrigation systems, obviously, probably provides the most important causal factor for the vast difference in yield between farmers in the two channels. Modern channel farmers were also found to be twice as likely as traditional channel farmers to have electricity or a bank account. We found no statistical differences in terms of having a greenhouse or packing shed.

TABLE 3: PHYSICAL CAPITAL DIFFERENCES (MODERN VS. TRADITIONAL CHANNEL)

Farm characteristic	Traditional Channel Farmer	Modern Channel Farmer
Farms with sprinkler irrigation equipment***	13%	43%
Farms with drip irrigation***	3%	38%
Farms with a tractor***	7%	29%
Farms with a pick-up truck***	11%	62%
Farms with a greenhouse	1%	5%
Farms with a packing shed	3%	5%
Farms with electricity**	22%	48%
Farms with a bank account***	26%	57%

Notes: ** = significant at the 5% level, *** significant at the 1% level.

In terms of organizational and managerial differences, we found that modern channel farmers were more likely to engage in any of the activities we investigated, although statistical differences were only found in terms of keeping records, weighing, packaging and grading and sorting (Table 4). We found no statistical difference in collaboration between farms on buying inputs, producing or marketing or in buying from other farms (uncommon in both channels). Neither did we find such a difference in terms of transporting the tomatoes to the market which along with grading and sorting is the most wide-spread activity amongst tomato producers in Zambia. Ownership of a pickup truck does thus not appear to be a critical determinant in the farmer's decision to transport their tomatoes to the market (as opposed to having them picked up by a collector coming to the farm).

TABLE 4: ORGANIZATIONAL AND MANAGERIAL DIFFERENCES (MODERN VS. TRADITIONAL CHANNEL)

Farm characteristic	Traditional Channel Farmer	Modern Channel Farmer
Farms collaborating on buying inputs	54%	67%
Farms collaborating in production	67%	67%
Farms collaborating in marketing	61%	62%
Farms keeping records***	34%	85%
Farms transporting their tomatoes to the market	78%	91%
Farms packaging (beyond crating)*	8%	24%
Farms weighing the tomatoes***	4%	62%
Farms buying from other farms	15%	19%
Farms engaged in grading & sorting*	72%	91%
Farms engaged in washing & cleaning	51%	71%

Notes: *=significant at the 10% level, *** significant at the 1% level.

5. SUMMARY, CONCLUSIONS AND IMPLICATIONS FOR DEVELOPMENT PROGRAMS

So far, market liberalization in Zambia has had only a limited impact on its tomato sub-sector. Modern supermarket chains from South Africa entered the market and established modern supply chains for fresh produce, based on standards, contracts, distribution centers and preferred supplier mechanisms. In processing, one new company emerged, FreshPikt, which has started to build similar supply chains as the supermarkets. Public standards, while in a catch up process currently, are not effectively enforced and did not adequately serve the needs of the modern food chains, hence the latter's need to develop their own standards.

Our survey of smallholder tomato farmers in Zambia's Lusaka region focused on who participates in the emerging modern supermarket chains. Similar to similar studies conducted in other countries (e.g., Hernandez et al 2006 for Guatemala) we found that households that are better educated, have more assets and have relatively significant cash incomes from activities other than horticulture/agriculture have benefited most from the new supermarket opportunity. This capacity difference indicates that there exists a threshold capital vector at the entry of the modern tomato channel. Interestingly we found that size was not a statistically significant determinant factor for participation. Another key observation was that farms in the modern channel have tomato yields that are three times those of farmers in the traditional channel.

Three key implications for development programs follow from these findings. *First*, the modern supermarkets' procurement strategy does create a dual horticultural sector, the degree of which will be determined by the market share they will build up over the next 5-10 years. Development programs assisting smallholder tomato farmers should integrate supermarkets (and other modern target markets such as industrial processors and upscale hotels) into their program as one of the markets targeted (for the A-grade tomatoes). *Second*, even if specifically focused on smallholder producers, economic development programs are unlikely to assist all targeted farmers in entering modern supply chains. Hence, development programs must be clear from the start on which farmers to include in the business model. Farmers not making the grade will either (1) benefit from the spill-over effects of the growth of the included producers (whose increased incomes are likely to stimulate the local economy) or (2) need to be targeted by social assistance programs. *Third*, the integration of smallholder farmers into modern, dynamic markets requires a balanced approach in which numerous complementary program elements need to be implemented with great synchronicity. In turn this requires that development programs involve all relevant stakeholders (private-public-NGO) and coordinate their activities carefully.

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