FROM MILLET TO TOMATOES

Productivity increase by means of introducing high value agricultural products in Meru, Tanzania

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1. INTRODUCTION

Most countries in sub-Saharan Africa are agricultural-based and the agricultural sector is dominated by smallholder producers with the household as the basic unit of production. Meanwhile, with 63 per cent of the population living in the rural areas and poverty rates remaining among the highest in the world with an average above 51 per cent rural poverty is one of the major challenges for economic development in the region (World Bank 2011).For the poor, agricultural based countries to achieve economic growth and poverty reduction a process of agricultural transformation is needed. Where smallholder farming is dominating this transformation process will be most successful if it is broad-based, i.e. inclusive and based on smallholders' productivity increase. A number of researchers argue that African smallholders hold the necessary capacity to be involved in such processes and practices contributing to successful agricultural growth through technological change and market expansion (see e.g. Haggblade and Hazell 2010; Hazell 2005; Mellor 1986; Timmer 2009; World Bank 2007).

This article focuses on one stream in the broad-based transformation process, namely opportunities for productivity increase by means of smallholders shifting their farming from low value to high value agricultural products. Such a transfer combined with market expansion has proven to be an efficient way of enhancing profitability within smallholder farming. Studies show that high value domestic markets for agricultural products, led by livestock and horticulture, are presently growing at 6-7 per cent per year in developing countries (World Bank 2007: 12).

Long-term processes of structural change are likely to be uneven with leading actors forging ahead at the local level (Gerschenkron 1968; Hirschman 1958). Consequently, case studies of potential leading regions are valuable when identifying and drawing general lessons from embryonic processes of agricultural transformation. Recent literature also suggests the need for more in-depth regional-specific studies of local systems of production. The

overriding goal is to capture more exactly the mechanisms driving processes of agricultural development (Nunn 2009).

This article is a contribution to writing such "new African economic history" (Hopkins 2009). It is a study of Meru in northeastern Tanzania, an economy that is agricultural based and where the agricultural sector is completely dominated by smallholders. Over roughly a century changes in factor endowments have lead to technological and institutional change in the local system of production with increased production of high value agricultural products. Simultaneously, growing rural and urban demand has expanded opportunities for high value markets. Meru can be characterized as a favored area according to the criteria given by the World Bank, i.e. it belongs to a group of regions classified according to their agricultural potential including access to irrigation, high to medium levels of humidity and medium to good access to markets (maximum five hours from a market town of no less than 5,000 inhabitants). More than 60 per cent of the rural population in developing countries globally, and 30 per cent of the rural population in sub-Saharan Africa, lives in such favored areas (World Bank 2007: 4-5). Consequently, it is argued that general lessons can be drawn from this case study.

The aim of the article is twofold. First, to verify and map the shift in smallholder production from low value to high value agricultural production in Meru. Second, to analyze the driving forces that are instrumental in the local broad-based process of intensification.

2. ANALYTICAL FRAMEWORK

2.1.The agricultural transformation

Agricultural transformation is defined as a process based on significant long-term productivity increase giving rising incomes for people employed in agriculture and releasing labour to be transferred to other sectors of the economy (Timmer 2009). It results in the economy being transformed from one where the workforce is primarily found in the rural areas and the economy is dominated by the agricultural sector, to one that instead is urban, industrial and service oriented (Mellor 1986). This is a key process if agricultural based countries, defined as economies where agriculture is the major contributor to growth, i.e. agricultural growth rate times sector share divided by GDP growth rate, is to reach sustainable economic development. Tanzania is such an agricultural based country. In 2006 agriculture (value added) represented 46 per cent of GDP, services 37 per cent and industry 17 per cent of GDP. Meanwhile, 50 per cent of the population lived in rural areas (World Bank 2011). Hence, it is

of the outmost importance for the Tanzanian economy to find ways of stimulating an agricultural transformation process.

The pathways that the agricultural transformation takes depend on the varying initial conditions that exist in different locations. In Tanzania in general as well as in Meru specifically the agricultural sector is dominated by smallholder production. Under such circumstances the transformation process needs to be broad base in order to be successful. Such a broad-based transformation process tends to have strong demand and supply linkages with the local economy and a poverty reducing impact. It is an inclusive process with an initial distribution of productive resources that is relatively equal. It is related with equality of opportunity whereby smallholders have access to resources via property rights and capabilities (World Bank 2007).

An increase in existing agricultural production is one way of enhancing smallholders' market integration, but it is not enough. Increased incomes derived from agricultural development will only be substantial if smallholders also make the transition from growing low value staple crops to producing high value agricultural products (Diao et el. 2009; World Bank 2007). Such shifts began when the African continent got involved in the global trade with cash crops in the late 19th century and it has been escalating ever since. In the beginning there appeared to be a simple divide between subsistence production with endogenous African food crops and cash crops produced specifically for the export market where production was driven by external demand. Export earnings were beneficial both for the state as it provided a basis for taxation and for individual producers for whom it provided cash incomes (see e.g. Austen 1987; Cooper 2002; Hopkins 1973). The dividing line has become gradually more blurred with the increased diversification in both production and consumption patterns and specialisation among farmers.

While classical food crops such as maize, cassava and rice have been the biggest income earners for smallholders during the 20th century, incomes derived from cash crops have also been of significant importance for smallholders' food security strategies. With the expansion of local, regional and international markets a growing number of crops are used for home consumption while also being marketed. The definition between subsistence and market oriented production, specifically among smallholders, has rather become dependent on the temporary outcome, such as the harvest, and not the structures of production patterns. First the smallholder caters for subsistence needs and if there is a surplus it is marketed. A more correct terminology for distinguishing between different types of crops would perhaps be food

cash crops, e.g. maize, beans, etc. and promoted cash crops, e.g. tobacco, coffee, tea, etc. A marketable food crop has the advantage that it can also be consumed by the household.

Although the majority of African smallholders are currently defined as net consumers and the element of subsistence production remains strong (World Bank 2007) they are also diversifying their farm activities as demand and supply, or consumption and production patterns, are changing. Preference for a certain crop appears to be correlated to several incentives apart from production price and profitability, such as farm gate price, labour costs, reliability of prices, access to inputs and extension, prior experiences and access to markets and traders. Studies show that because of these multitudes of aspects smallholders will opt for a food cash crop unless profitability is considerably higher with a promoted cash crop (Boateng et al. 1987; Gladwin et al. 2001).

In Meru over the last century, and with a significant escalation over the last three decades, a range of high value agricultural products have been introduce, e.g. coffee as a promoted cash crops, vegetables as food cash crops and dairy as high value agricultural products. Growing demand driven by rising incomes, rural land scarcity, greater female participation in the work force, etc. constitutes a push for the shift to high value products as well as semi-processed and processed products. Changes in preference and taste paired with the entry and rapid growth of supermarket chains, are also trends that open up for new markets for a wide range of high value products (World Bank 2007: 124).

A change-over in production could be a way of tapping into an increasing urban demand stemming from the growth in both urban population and wealth on the continent. If markets are well functioning then urbanisation can be a positive force. Several studies show that increasing urbanisation is affecting local farming systems in present sub-Saharan Africa. In particular, it is mixed farming, farming systems combining crop farming and cattle raising that appear to have a lot to gain as the demand for high value products, e.g. meat and dairy products, is the greatest in the urban areas where general income levels are the highest (see e.g. Jayne et al. 2006; Tiffen 2006).

2.2. Induced innovation

Hayami and Ruttan's (1971, 1978, 1984) modification of the *induced innovation* theory for analysing agricultural development appears appropriate for analysing embryonic transformation in the Meru case. They hypothesise that change in factor endowments, particularly the relative price of land and /or labour, causes farmers to participate in processes of technological and institutional change. These processes of farm intensification are

endogenous rather than exogenous to the economic system and they are more typically the result of long-term incremental change than off radical shifts. Further, each country's, region's pathway is different as it is consistent with specific factor endowments (Biswanger 1978). Both technological and institutional change can take place on the macro as well as the micro level. On the micro level they may cause intensification in a local production system without being a driver of a macro transformation.

The factor endowments perspective is connected to a more general theorising on whether agricultural development primarily is driven by institutional change or changes in factor endowments. In the case of Africa this debate goes back to Ester Boserup's (1965) thesis on population increase being the exogenous force causing changes in farming systems and agricultural growth. Through the study of stages within an evolutionary scheme she demonstrates how increasing land scarcity causes changes in fallow systems and how intensification is associated with an increased frequency of cropping. The increased land productivity is accompanied by decreasing labour productivity. Because intensification of farming systems requires added labour smallholders will avoid intensification until an increasing need for food makes it necessary.

The factor endowments explanation has stayed central in the debate on identifying the driving forces in African agricultural development from a long-term perspective. In generalizing terms sub-Saharan Africa has been characterized by an abundance of land relative to labour and capital (Iliffe 1995). Consequently, labour scarcity has, over time, been the most important constraining factor for growth of agricultural output and the key explanation for persistence of extensive agricultural practices (Austin 2008). Until today, agricultural extensification has dominated as a means to feed a growing population and intensification has usually been limited in time and space to what Widgren and Sutton (2004) call 'islands of intensification'.

Yet, the situation appears to be reversing. Austin (2008) argues, in a critical revision of the factor endowment perspective, that there are signs of Africa increasingly moving towards intensive agriculture due to shifts in factor ratios. As the land frontier has been reached or is about to be reached in several regions (Djurfeldt et al. 2005) the continent is currently in the middle of a major transition phase whereby the inner logic of a labour scarce rural economy is slowly eroding. Meru is such an island of intensification characterized by land scarcity and access to surplus labour.

The induced innovation model assumes that actors within a system of production can substitute the scarce production factor, that being labour or land, with the help of technology.

When the scarce factor is labour mechanization in order to increase labour productivity by replacing humans with machinery is the rational technological solution. In the case of Meru, however, population increase and limited geographic expansion has made land the scarce factor. To increase land productivity in such a scenario technological change can include irrigation, bio-chemical technology, introduction of high value crops, etc. This type of technological change is termed biological innovation.

Although Hayami and Ruttan treat technological change as endogenous to the system of production this does not mean that they hypothesis that these systems are isolated or without exogenous influx. There are three phases in the process of technology transfer: A) Material transfer, which is characterized by the simple transfer or import of new materials, e.g. seeds, plants, animals. B) Design transfer when technology is transferred primarily in the form of formulas or books, written information. C) Capacity transfer, signifying that scientific knowledge is used to create the capacity for adaptation of technology to local conditions. Any of these technology transfers is made difficult if the recipient is very different from the precursor (Evenson and Biswanger 1978).

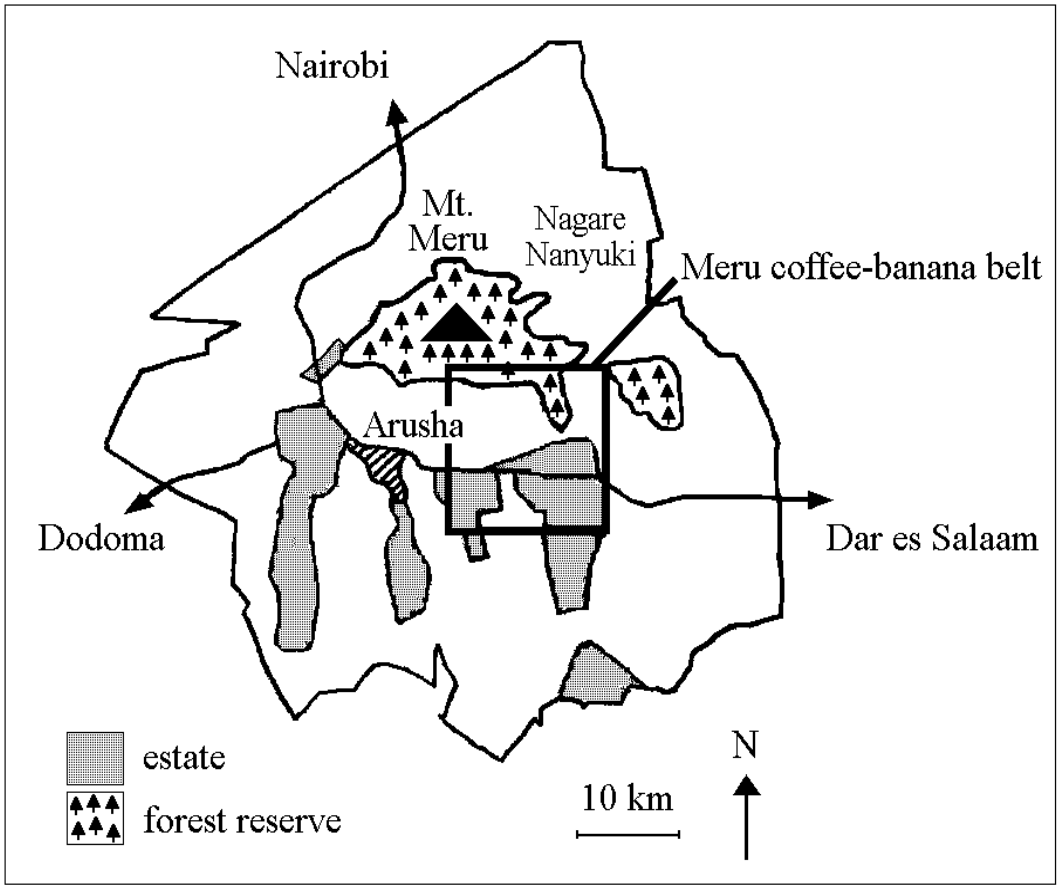
Although it is assumed that technology is the driver of productivity growth the use of technology is conditioned by conditioning institutions. Technological and institutional changes are intertwined and how technological and institutional change combines in the transformation process is an empirical question (Ruttan 1978). Of particular interest here are institutions that may have direct bearing on the organizational form of the agricultural production system or the reform of existing markets and the expansion of new markets. Markets are the necessary intermediates between demand and agricultural production and if they are well functioning they can provide the incentives for productivity increase and technological change. Just as in the case of farm intensification, market expansion can be successful as an endogenous bottom-up process (Barrett 2008; Hayami and Ruttan 1971).

Most African smallholders today are pairing subsistence farming with marketing a smaller surplus production. If these smallholders are to improve their incomes it requires opportunities to increase market oriented surplus production for domestic, national and international markets (Barrett 2008; World Bank 2007). In Africa market systems are, however, technologically and institutionally relatively under developed. This poor state of markets hinders an accurate reflection of both the relative price between factor endowments and the production relationship between supply and demand. Consequently, one of the most important processes of change on the road to agricultural development is market reform.

3. AREA BACKGROUND AND DATA

The Meru area is located five kilometres east of Arusha town in north-eastern Tanzania. It covers roughly fifty square kilometres on the south-eastern slopes of Mount Meru, an extinct volcano rising 4,565 metres above sea level. The soils are of volcanic origin and soil fertility is considered to be medium to high. It has a tropical climate moderated by altitude and a bi-modal rainfall pattern with an average precipitation of more than 1,200 mm per annum. Climatic conditions paired with technical advances such as gravity irrigation guarantee a fair access to water for agricultural purposes. Due to coffee-banana intercropping the heartland is termed the "coffee-banana belt", but several other crops, such as fodder grass, maize, beans, and a great variety of vegetables, are also grown. There is also a dairy sector of growing importance with stall fed exotic breeds. The favourable agricultural conditions have been a precondition for the development of intense farming methods.

Map 1: The Arumeru District with Meru coffee-banana belt



Source: Modified from Larsson (2001: 29).

This is an area with high population density and demographic conditions have been a driver of the intensification process. While the national average in Tanzania is forty-one persons per square kilometre, the density in the coffee-banana belt is on average above 1,000 persons per square kilometre (Larsson 2001:39). The area was never subjected to the villagisation program in the 1970s. The main reasons were the dense population and the presence of coffee which is a perennial crop. Consequently, there is no concentrated village settlement in the coffee-banana belt. The villages function as an administrative division where the dwellings are spread out. Smallholders primarily cultivate the plots surrounding the homestead, but it is becoming increasingly common to rent land in surrounding villages where it is less scarce.

The heavily trafficked Dar es Salaam-Nairobi road cuts through the coffee-banana belt and from there dirt roads venture up the mountain slopes and to the plains in the south. The relatively well functioning transport infrastructure facilitates farmers' access to markets both in Meru itself and in Arusha town. Arusha has a population of more than 270,000 (National Bureau of Statistics Tanzania 2005) and its economy is centred on tourism, mining and a large service sector. Size and economic dynamics makes it one of the biggest and most important towns in Tanzania. The continuously growing urban demand has influenced agricultural production in the Meru area.

Data has been collected within a project on smallholders' production and marketing strategies running 2008-2011. Questionnaires have been distributed in ten villages in Meru coffee-banana belt where 240 smallholder households have been sampled to represent variations in wealth, age, gender, climate conditions, agricultural production and distance to the main road and markets. Questions were asked on production and marketing of high value agricultural products, e.g. coffee, vegetables and dairy, as well a s their importance as sources of income for smallholders. In 2009 the general market expansion in the area was also investigated in a qualitative study including a variety of agricultural products. Marketing channels were mapped using in-depth interviews with traders.

4. CHANGING FACTOR ENDOWMENTS

Processes of induced innovation including alternations in land/labour relations, micellinouse technological change and market expansion have been ongoing in Meru for over a century. It started in the late 19th and early 20th century with land alienation as the German colonial administration granted primary agricultural land to German and Boer estates and the reigning

Meru chief also sold off land to settlers. Further, the colonial administration established a forest reserve above 1,600 metres on Mount Meru and the introduction of British rule after WWI brought only a modest expansion up the mountain slopes. Meanwhile, expansion to the West has been blocked by the Arusha people since the mid-19th century (Spear 1996:16; Larsson 2001:31-32). Consequently, since the early colonial era opportunities for smallholders to open up the land frontiers were limited.

Meanwhile, population increase on the mountain has been radical in the decades that followed land alienation. Between 1928 and 1948, the population increased from approximately 12,000 to 19,000 and during the next two decades almost doubled again (Larsson 2001: table 4.1). The average population density on the mountain grew from thirty-seven individuals per square kilometre in the 1930s to 114 in the 1960s (Spear 1997). Tensions caused by high population density and land shortage drove many smallholders to abandon the coffee-banana belt in the 1950s, migrating either to the northern highlands or to the lowland to the east and south (Spear 1997). Out-migration has stayed on as a strategy to deal with the imbalance in supply and demand for land. Presently there is both seasonal and permanent migration, within and outside the district, rural to rural as well as rural to urban. When it comes to permanent migration, out-migration exceeds in-migration, but it is still small in view of the acute shortage of land in some localities (Kivelia 1995:58). Population density has remained extremely high. Villages presently experience a population density of 1,000 persons per square kilometre on average, while those located along the Dar es Salaam-Nairobi road can reach 2,000 persons per square kilometre (Larsson 2001:35).

Population increase and land scarcity have had a profound effect on land use, farming systems and property rights structures. When the Meru first settled they founded permanent settlements surrounded by fields for bananas, maize, beans and millet. Further away from the homesteads they cleared land for grazing cattle and small livestock. An extensive mixed farming system was established and when population increased new land was cleared. As land scarcity became a major concern from the 1930s onwards farming methods slowly transformed from being extensive to being intensive. When plots became smaller, intercropping became more common. In a typical plot today coffee is grown in the shade of banana stems and beans are covering the ground under the coffee trees, while fodder grass is been planted along the edges (Larsson 2001). Meanwhile, previous grazing areas have been turned into plots for crop farming. Over the years the Meru have moved many of their animals to the plains to the east and south and livestock left in the coffee-banana belt are being stall fed (Hillbom 2011a).

In villages with the highest population density land scarcity is so severe that farming is no longer an option for many people as the plots of land are too small to host anything but the residence. There are no official estimates at the regional, district or village levels to determine plot-size. However, academic studies show that the average size of a land holding can be as low as 0.3 hectares per household and that a large and increasing section of villagers are landless (Larsson 2001: 35). In the questionnaire sample (2008-2011) the average plot-size in the village was 1.8 acres, this, however covered villages of varying population density. Intentionally, the sample only included smallholders and not landless. To compensate for the insufficient plot-size in the village 36 per cent of smallholders rented land in other villages. The average size of rented land was 3.6 acres.

5. TECHNOLOGICAL AND INSTITUTIONAL CHANGE

The first significant technological change to take place in the traditional farming system was the construction of irrigation furrows in the last decades of the 19th century. Irrigation was from the onset intended foremost to increase security, making smallholders less dependent on seasonal rains, and to save on labour efforts (Puritt 1977: 93). However, due to intensification of farming methods, induced by local population increase and growing land scarcity, the need for irrigation water has steadily increased in the area over the last 100 years. The demand has escalated during the last two decades, especially on the lower slopes where rainfall is more erratic and scarce, and more and more irrigation furrows have been constructed (Carlsson 2003).

The construction of irrigation furrows has not only entailed technological change, it has been accompanied by institutional development as well. Furrows belonging to smallholders are held as communal property managed by water committees guided by their own by laws. All smallholders living along the stretch of a furrow are potential members of such a committee, none are excluded. It is through membership in a water committee that the individual can apply for allocations and gain temporary private user rights. The construction of irrigation furrows has then caused the development of new property right regimes (Carlsson 2003). Despite fierce competition over water resources smallholders consider their rights to water to be relatively secure as there is a well functioning institutional structure governing the furrows (Hillbom 2011b). However, access to water can never be guaranteed due to varying natural circumstances.

Having access to irrigation water has become a pre-condition for smallholder's successful transit into production of high-value crops. In the questionnaire sample (2008-2011) 67 per cent of smallholders state that they have access to irrigation. Smallholders who lack access to irrigation claim that they do so because there is no furrow that could reach their fields and therefore they are not members of a water committee. Although there is an input in labour and cash in the furrow no smallholder claimed this to be a reason for not securing irrigation. 17 per cent of smallholders who did not have access to irrigation stated that this was a problem as it prevented them from optimal farm production. The construction of irrigation furrows has then entailed both technological and institutional change that has been successful in promoting farm intensification as it has been a pre-condition for the introduction of high value crops and productivity increase.

The first high value crop to be introduced and commonly spread in the local system of production in Meru was coffee. It was introduced in 1902 by German missionaries and in the 1920s coffee production by Meru smallholders picked up and established itself as a primary source of cash income for the households. The technological change represented by the new crop also had institutional implications as marketing boards were set up to control the purchase of smallholder's crops as well as exports of coffee. Coffee had advantages for the Meru farmers as it was easily intercropped with their staple food, bananas, thereby increasing the rate of return on both land and labour. From the start coffee production was depending on access to irrigation water. Compared with traditional staple crops such as millet or bananas, coffee was more sensible during the dry season and large amounts of water were needed for pulping and washing the coffee beans. Up until the late twentieth century coffee production continued to increase despite opposition from the settler community, low world market prices, and even poorer local prices (Spear 1997).

During the last three decades coffee has received severe competition from other cash crops, primarily vegetables. While vegetables are cash food crops that are also consumed by the producers, coffee is a promoted cash crop and since no one consumes coffee the only value of the crop is what it brings in the market place. In the sample 38 per cent of smallholders produced coffee. Reasons for the decreasing popularity of coffee are: high costs for in-puts, volatile prices paid to producers and seasonal incomes. If a smallholder wants to secure good harvests s/he needs to buy expensive pesticides and fertilisers, without such in-puts harvests will quickly be less than optimal. Since the 1980-90s and the deregulation of subsidies such inputs have increased in price and even if the farmer can afford them they are not always available. The liberalisation of the market has meant the opportunity for private

buyers to compete with the coffee cooperatives. Considering that the world market prices for coffee have been reduced during the last two decades producer prices have not increased. It has, however, become more difficult for the individual smallholder to navigate between the various buyers who offer different prices and conditions. It appears that while producer prices have decreased, transaction costs have increased. Irrespective of who the buyer is payments are made in bulk sums ones or twice per year. Many smallholders consider this to be disadvantageous as they find it difficult to economize with the earnings throughout the year. Some still prefer to sell to the co-operatives because these will usually offer in-puts on credit that can be cleared with the next harvest. In the sample 28 per cent of coffee producers sold their coffee to a co-operative, 72 per cent to private buyers.

There appear difficult to pin point an exact starting date for the production of vegetables in Meru, but has been promoted through a large number of government, NGO and private initiatives for over half a century. While vegetables (tomatoes, cabbage, Irish potatoes, carrots, etc.) then were cultivated since at least the decade before independence they became commonly popular in the 1980s as they started to compete seriously with coffee as the major cash earning crop. The technological change of moving into land and labour intense high value crops such as vegetables resonates with the induced innovation theory. While vegetables are comparable to coffee in the sense that they also demand extensive inputs in the form of irrigation, improved seeds and fertilizers, they have advantages in that they can be used for home consumption, profit levels are higher and as the crops are seasonal instead of perennial the farming is more flexible. In the questionnaire sample (2008-2011) 49 per cent of farmers claim to be growing vegetables. The limiting factor is access to more irrigation water and more farm inputs. 18 per cent of smallholders state that they could produce more vegetables if they had better access to more irrigation 78 per cent if they had more capital to buy improved seeds and fertilizers.

The expansion of vegetable farming relies on increasing rural and urban demand for the crops. Technical change has then been accompanied by institutional development mainly in the form of market expansion. There are a number of marketing channels for smallholders to choose from and the great majority use a mix of marketing strategies depending on type of crop, time management, price, and so on. 55 per cent state that they sell to traders coming to their farms, a strategy that is advantageous because it saves time as well as costs of transport and market place fees. 73 per cent also go to the market themselves as this renders a higher price and once there they may sell to traders or individual consumers. A less common strategy is to set up contracts with super markets or specialised traders in and outside of Arusha,

expanding into new vegetable varieties such as green beans, baby corn, lettuce and peas. None of the smallholders in the questionnaire sample used this strategy, but it has been verified by in-depth interviews on the general markets expansion for agricultural products (interviews with 6 traders in Arusha and 2 vegetable co-operatives in Meru).

In the 1960s there was a new development in Meru as exotic breeds of cattle were introduced. In two parallel processes over the next two decades the open grazing range was turned into crop farming and livestock became stall-fed, while milk production went up as the exotic breeds replace the traditional Zebu cattle. Admittedly with some support from NGOs and the government of Tanzania this process was primarily a case of endogenous change within the local system of production and the driving force was the changing land/labour relationship (Hillbom 2011a). In the questionnaire sample (2008-2010) 84 per cent of smallholders state that they own livestock of exotic breeds. The stall-fed exotic breeds require a large labour input in regard to collecting fodder (primarily banana stems and grass), cleaning stalls and generally caring for the more valuable new livestock. The exotic breeds are also more capital intense as they require expensive extra fodder high on nutriments, insemination, vaccinations and other veterinary services to reach their optimal production capacity. Input of labour and capital has then replaced land (Hillbom 2011a). While labour is a relatively cheap production factor, capital is more difficult to come by for the smallholders. Cattle holders ability to provide the required inputs vary with changes in incomes, but generally a large majority state that lack of capital prevents them to optimise their milk production.

At first milk production continued to be for subsistence use, but in the 1980s a rising urban demand from Arusha further fuelled the process by significantly expanding market opportunities for various high value agricultural products, including dairy. Over the last two-three decades the attitude towards dairy cows and milk production has changed, from home consumption to an important and dependable source of income. With land scarcity and the growing number of landless in the rural areas also the rural demand for milk has increased. Altogether urban and rural demand exceeds local production. Milk incomes have the advantage over e.g. coffee that it is a daily earning and much easier to manage for the individual household (Hillbom 2011a). All in all 22 per cent households in the questionnaire sample (2008-2010) state that milk is their primary income.

The use of fertilizers is necessary for increased land productivity and the extent of the use is determined by price. As the price of fertilizers decline in relation to the price of land the use of fertilizers will go up. The same logic applies to the use of other types of inputs, such as

seeds for new crop varieties (Ruttan et al. 1978). In the questionnaire sample 78 per cent of smallholders state that they would like to use more fertilizers, seeds and other types of inputs in their production, but high prices are limiting them. Although they know that it is worthwhile to invest in these inputs and that they will improve their harvests and increase their incomes with such investments smallholders also have to pay school fees for their children, care for the animals, and so on. The lack of access to excess capital appears to be a seriously limiting factor for the Meru smallholders.

6. MARKET EXPANSION

The induced innovation theory presupposes that technological and institutional change in the agricultural sector takes place in conjunction with expanding market opportunities. Such market expansion has been taken place in Meru. First, the expansion of coffee production was a response to export opportunities and for over half a century this was the main source of cash income for Meru smallholders. Late 20th century market expansion for both dairy products and horticulture has, in turn, primarily been a result of increased local urban and rural demand, although there are also national and international outlets. Bananas is a traditional crop that has not brought any significant technological changes to farming methods in the resent century, but which is now increasingly being demanded by the growing urban population inside and outside of Tanzania. Due to market expansion during the last couple of decades bananas are now among the top income sources for smallholders.

The economic success and continuous expansion of nearby Arusha town has meant a growing number of consumers in general and of consumers with improved levels of income specifically. Arusha is a town of great national importance in Tanzania. With its proximity to Serengeti National Park and Mount Kilimanjaro it is a centre for a booming tourist industry. To the south there are tanzanite mines unique to the country and the trading in gem stones is another important economic activity. Due to its relatively cool and pleasant climate it is also a favoured site for NGOs, government employees and international organisations. The urbanisation process does not only entail the growth of Arusha town, but there is also an increase in population numbers in the urban and semi-urban settlements in Meru itself, such as Tengeru, Usa River and Magia Chai.

The case study shows that urban demand influence rural production and that rural-urban exchange is dynamic and positive for smallholders. This conclusion fits well with other studies. Cour (2001) argues that for safety reasons subsistence farmers generally aim at

producing 20 percent above what is required for their own immediate needs. The surplus production is primarily a safety buffer. However, smallholders are simultaneously interested in selling their excess production in order to obtain incomes to meet those needs that go beyond what subsistence agriculture can offer. Thereby agricultural surplus can be transferred to the urban population. An increasing urban demand would give farmers further incentives to alter their farming methods to increase production and productivity. A critical point is reached when urban dwellers make up 30 percent of the area's population. According to Cour this is the point when urban demand becomes significant to the point that subsistence farmers in the surrounding rural areas gain enough incentive to move away from subsistence farming and produce specifically for the market. Meru is located in Arumeru District surrounding Arusha town. Combining the population of Arumeru District and Arusha town, the area's urban dwellers constitutes roughly 35 per cent of the total population. In light of Cour's estimations this would be a sufficient urban demand for increased market oriented agricultural production in Meru.

It is, however, not only from the urban areas that there is an increasing demand for agricultural products. In the coffee-banana belt more smallholders are left with less land and plots are becoming too small to feed the household and provide an income. Instead, smallholders have to turn to off-farm incomes and they become permanent net consumers of agricultural products as they try to simultaneously profit from the rural and the urban, alternating between occupations. As will be shown the opportunities for smallholders to market their products are many and they use several different strategies simultaneously depending on the crop, previous experiences, temporary opportunities, etc.

Some smallholders still sell their agricultural products, primarily bananas, vegetables and milk, within the village, either to neighbours or to the village-shops, which are numerous. In the questionnaire sample (2008-201) 20 per cent of dairy farmers adhered to one of these strategies. Those who sell to shops may have a contract where they are expected to deliver products every day or week and they are paid weekly or monthly. They may also run a credit in the shop buying animal feed and other necessities, which is later deducted from the payment for their products. There is no shortage of local customers as there are many households which do not produce enough in their farms to cover their home needs (interviews village shop keepers, September 2009).

One alternative to selling within the village is to travel to one of the semi-urban or urban areas nearby. It can be Arusha or one of the local markets in Meru where there is a substantial demand for agricultural products. Bananas, vegetables and milk are sold fresh in the market

place, to traders, supermarkets, hotels, restaurants or dairies. In the questionnaire sample (2008-2010) only 4 per cent marketed their products themselves in Arusha, but as many as 74 per cent went to nearby markets in Meru. The opportunity costs for smallholders to invest labour and financial resources in transporting their products to town are high, especially if they are small scale producer. However, the profit will increase as the producer gets rid of the middle men. Some more large scale producers may pool together with neighbours to organise transports (interviews with traders, September 2009).

To avoid having to go to the market smallholder can sell coffee, maize, beans, bananas, vegetables and milk to private traders who travel around to the farms. While the prices offered by travelling traders are lower the advantages for the smallholder is that s/he saves the time and the costs of going to the market. 55 per cent of smallholders sell to traders who come to their farm. The co-operative movement was powerful in Tanzania in the 1950-70s, but in Meru most co-operatives have disappeared or are in decay. Still, there are a few vegetable and milk co-operatives and a number of surviving coffee co-operatives as well and 11 per cent of the farmers use co-operatives for marketing their products.

The expanding urban markets take various forms and new market places take over as the African urban settings become increasingly modern. Urban supermarkets for high value agricultural products for domestic consumption are, for example, the fastest-growing mediators of agricultural products in most developing countries today (Delgado et al. 1999; World Bank 2007:12). As Arusha is a dynamic town with a growing economy and increasing level of income, supermarkets are well established there. Supermarkets in general start with targeting upper-income households, then the middle class and finally the urban lower-income earners. Supermarkets are primarily interested in processed foods such as cheese, secondly in semi-processed such as treated milk and lastly in fresh foods (World Bank 2007:126).

Generally, customers for supermarkets come from a relatively small number of socioeconomic groups in town who can afford to spend more on food and have more diversified consumption habits than most Tanzanians. These groups are businessmen within the tourist industry, foreigners who work temporarily in Arusha, and Tanzanians enjoying higher than average levels of incomes, including many members of the Indian community. Correspondently there is a minority of smallholders who produce for these consumers. While processing plants are very rare in Meru, there are a small number of dairies who produce for the supermarkets, tourist hotels and specialised market stalls in town. There are also contract farmers who produce vegetables such as lettuce, leak, sweet pepper, baby corn, etc. on demand (interviews with traders and dairy representatives, September 2009).

7. CONCLUDING REMARKS

The induced innovation theory stipulates that changing factor endowments will lead to technological and institutional change in the agricultural sector and that the process of improved productivity will be further enhanced as demand and supply are matched in expanding markets. It is argued that the current case of Meru in Tanzania fits well with the induced innovation theory. In the text it has been shown how change in land/labour ration has promoted a farm intensification process, which has called for less input of land, the expensive factor of production, and more input of labour, the relatively cheaper factor of production. To increase productivity under such circumstances smallholders have turned to technological change in the form of irrigation, new crops including coffee and vegetables, introduction of high yielding exotic breeds of cattle and increased use of farm inputs such as fertilisers and improved seeds, i.e. the transfer from low to high value agricultural products. Such technological change has been accompanied by institutional change, e.g. new property right regimes governing the irrigation furrows, marketing boards, co-operatives and expanding markets. The increasing demand for agricultural high values has come primarily from the nearby growing Arusha town, but also from rural areas, other parts of Tanzania and as exports. Hence, as stipulated by the induced innovation theory the market has played a decisive role in providing the incentives for smallholders to increase their productivity, in the case of Meru by moving into high value agricultural products.

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