Trans-SEC
Innovating pro-poor Strategies to safeguard Food Security using Technology and Knowledge Transfer

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Assessing commercialization for smallholders to enhance market integration and information to bring added value in agricultural food systems

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1. INTRODUCTION

Sub-Saharan Africa's rural economy remains strongly based on agriculture relative to other regions. Agriculture in SSA (excluding South Africa) employed 63% of the population and generated 25% of the GDP of these countries in 2014 (Schaffnit-Chatterjee 2014). These agricultural production systems are largely based on smallholder family farms, defined as being 2 ha or less, represent more than 80% of all farms in SSA, and contribute up to 90% of the production in some SSA countries (Peck & Anderson 2013). Agriculture creates jobs, generates income, produces food and contributes to social stability, the sector is essential to SSA's development. Developing it prudently is the way to a future where Africa can feed itself and contribute to feeding the world. In an effort to encourage countries to increase food security, reduce poverty, promote economic growth and create wealth through agricultural growth, the African Union has declared 2014 the year of agriculture and food security in Africa (FAO 2014).

Smallholder commercialisation is one of those prudent ways of improving food security (URT 2011) in its broad sense through strengthened food systems. Commercialisation of agriculture is a phenomenon where agriculture is governed by increased role of markets for both input factors and outputs.

With funds from the Germany government, Trans-SEC project brings together about 14 partners from the North and South undertaking research on food value chains for improving food security and income of the rural poor farmers. This report presents an assessment of commercialisation in of smallholder farmers in the Tanzanian case study sites to inform empirically the commercialization pathways of smallholders.

The objectives of the study are:

i. To assess agricultural commercialization status and pathways in the CSS
ii. To indentify factors influencing commercialization pathways
iii. To underpin policy implications of commercialization pathways

2. METHODOLOGY

2.1 Description of the study area

Two case study regions were selected, the semi-humid Morogoro and semi-arid Dodoma. Both regions together account for 70–80% of the farming systems types found in Tanzania. For each region three case study villages were selected representing different farming systems in the regions.

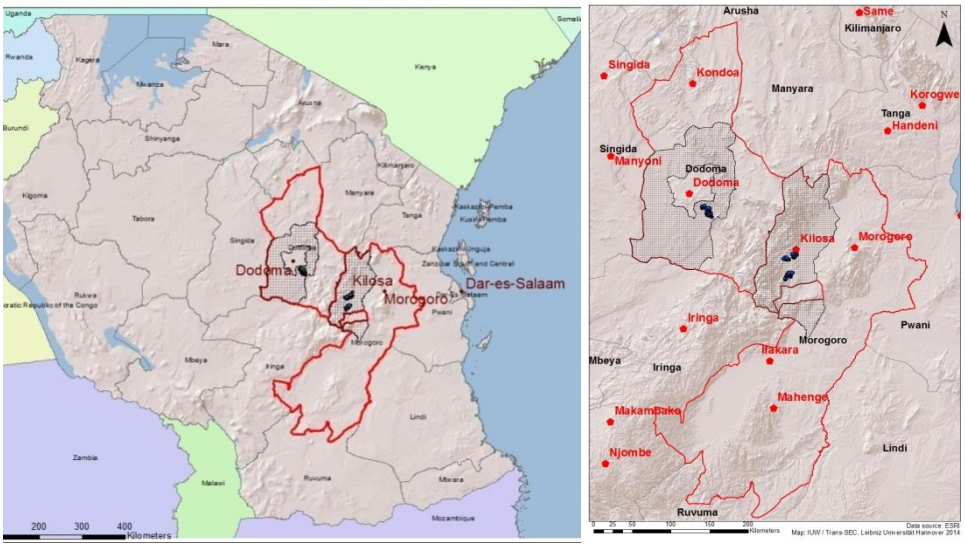

Figure 1: Case study regions in Tanzania

2.2 Selection of sample households

The households were randomly selected from village household lists. These lists contained information of the names of household heads and the corresponding hamlets. In each village, a proportionate sample of 150 households was selected from each of the 6 villages of which 2 were control villages. This sampling made a total of 600 households from the case study sites and 300 from the control villages – making an overall sample of 900 households.

2.3 Data collection

The survey was conducted in February 2014. A range of data typologies was collected. These included household-related income activities (e.g. agriculture, off-farm, self-employment, remittances, transfer and aid payments) and expenditure (food and non-food).

2.4 Data analysis

2.4.1 Descriptive statistics

Descriptive analysis involved the use of ratios, percentages, means and standard deviations in the process of comparing demographic and socio-economic factors related to commercialization of farming households.

2.4.2 Crop commercialization index

Following Braun & Kennedy (1994) the household crop output market participation in annual crops as the proportion of the value of crop sales to total value of crop production which is refer to Crop-Output Market Participation index or Crop Commercialisation Index (CCI) specified as in below:

$$CCI_i = \frac{\sum_{k=1}^{k} \bar{P}_k S_{ik}}{\sum_{k=1}^{k} \bar{P}_k Q_{ik}} \quad (1)$$

Where:

S_{ik} = Quantity of output k sold by household i evaluated at an average community level price $\bar{P}_k$

Q_{ik} = Total quantity of output k produced by household i

A value of zero for the CCI signifies total subsistence, while a CCI value approaching 100 indicates higher degrees of commercialisation i.e., a greater percentage of produced crop is marketed.

i. Wealth Index

The wealth index tells us about relative poverty based on possessed assets. The level of wealth can define the potential of a farmer to engage with market hence commercilize. The wealth index is based on asset ownership (Vehicles, electronics, animal and equipment) and household characteristics (Materials for walls, floor and roof, water and sanitation and household members) rather than monetary income. This explains accumulation of income and conversion of this income into different assets overtime. Principal Components Analysis (PCA) was used in the computaton of the wealth index. Through PCA, each asset and household characteristic is given a factor weight and based on these each respondent in the sample can be given a wealth index score.

PCA is a statistical method which determines the relative importance of each variable when seeking to summarize a set of variables (DeVellis 2012). When applied to asset and household characteristic data from a representative survey, PCA can be used to create one summary measure of household wealth (Vyas & Kumaranayake 2006). The survey dataset has a set of variables that are correlated in complex and unknown ways along multiple dimensions, PCA was used to reduce those variables by assessing which variables behave in a similar manner. Based on the variables and their relationships to each other, PCA creates a new set of variables 'principal component'. The first principal component accounts for the largest possible variance across the specified variables. The second principal component is not linearly correlated to the first principal component and accounts for as much of the remaining variance as possible. Each succeeding component accounts for as much of the remaining variance as possible and are not linearly correlated to any of the preceding variables.

The study is looking at relative poverty by dividing the sampled population into equal quartiles. A quartile is a quarter (25%) of the population. A key reason for creating wealth quartiles is to look at how relatively commercialisation is distributed by wealth status. It is assumed that wealth is the factor that accounts for the largest amount of variance between households' assets, characteristics and commercialisation. Based on the first principal component, each variable representing possession of a particular asset is given a 'factor weight' across the sample. The weighted possessions of assets were simmed across the asset portfolio to determine the overall wealth index.

ii. Commercializationd drivers and pathways

The commercialization drivers and pathways were analyzed through a ranged of approaches – including descriptive and correlations. Descriptives were used to illuminate commercialization levels of different crops, distribution of wealth, crop production and sale levels, and crop storage for both deferred sales and future consumption. Correlation analysis used to tease out the relationship between wealth index and commercialization of different crops.

3. RESULTS AND DISCUSSION

3.1 Important factors for commercialisation

The perceptions of farmers were gauged on key factors underling commercialization of smallholder family farms in rural Africa (Table 1). Majority of the respondents had access to land as a critical productive resource. Overly farmers felt that they have been experiencing climate change and variability over the past 20 years. Climate risks affects commercialization both in terms of both level and stability of farm production. However, most of the farmers were regarded themselves to be risk takers. The risk taking behaviour is an inherent feature of farmers pursuing their farming activities in the dryland semi-arid and sub-humid areas. Access to credit was very limited among the farmers as only 5-6% in the two case study regions had access to formal and informal credit. Only a few manage to have any saving – 36% and 22% in the sub-humid and semi-arid regions, respectively. Reliance of public transfer which is normally in the form of relief food was apparent (48%) in the semi-arid area. Crop failure is much more frequent in the semiarid area compared to the sub-humid area.

Table 1: Perceptions of farmers with respect to important commercialisation factors

Commercialisation factors (Yes)	District (%)	
	Kilosa	Chamwino
Land possession	95.55	100
Perceived climate change in the past 20 years	99.33	93.66
Risk taking behaviour	96.88	96.87
Involved in self-help micro-credit groups	6.26	6.24
Involved in SACCOS	6.14	5.00
Possessed any savings	35.63	22.27
Received public transfers in the last season	1.78	48.33

SACCOS= Savings and Credit Cooperative Society

3.2 Distribution of wealth index

Commercialisation improves incomes of the households hence reducing poverty through wealth creation. Normally, households will be divided between rich and poor. But more sub groups in each of rich and poor can be developed within each group so that as understand the povety depth and dynamics. Therefore, there are the destitute (poor of the poor) in lower group and middle incomers in upper group. Findings show that Chamwino has the highest percentage of the destitute at about 69% of all destitute (poor of the poor) in sampled population (Table 2). Chamwino also has the lowest of the middle incomers and rich. Kilosa has the highest of the poor (64%). This calls for intervention in both districts to be heavily intervened in combating poverty. The pathaway to set these farmers on the path out of

poverty is to intervene in the agriculture. Promising interventions should involve devising of and scaling-up strategies that will upgrade rainfed agriculture by improving productivity, value addition and market linkages.

Table 2: Wealth status distribution by percentage in case study districts

Wealth status	District (%)	
	Kilosa	Chamwino
Destitute	31.19	68.81
Poor	64.37	35.63
Middle incomers	53.02	46.98
Rich	69.73	30.27

3.3 Commercialisation levels of the crop sub-sector

Considering all farmers who participated in the market, commercialisation for all crops combined was at around 53% (Table 3). The most commercialised crops are Simsim (83.5%), Tomatoes (71.6%), Pigeon peas (66.6%), Sunflower (59.4%) and Groundnuts (53.85). Less commercialised crops were the food staples Sorghum (13.7%), Millet (15.6%) and Maize (28.1%). The later is bad news for food and nutrition security as market cannot absorb food shortage shocks from crop failure as farmers do not produce staples for market. Simsim, Groundnuts and Sunflower are the most commercialised crops.

Table 3: Specific crops commercialisation levels

Crops	Obs	Mean	Std. Dev	Min	Max
Cowpeas	64	37.76	34.64	8	98.4
G/nuts	242	53.80	10.16	50	97.5
Maize	540	28.10	24.11	5.5	90
Millet	54	15.57	19.29	8	80
Pigeon peas	53	66.55	14.55	50	87.5
Simsim	280	83.51	17.79	50	98.9
Sorghum	175	13.65	14.50	8	90
Sunflower	150	59.43	16.93	50	98.3
Tomatoes	16	71.57	17.83	50	95
General (all) crops Index (CCI)	572	52.96	24.71	5.5	100

Given the fact that the two sampled districts have different agro-ecological zones, it was worth investigating commercialisation by study locales. Simsim was the most commercialised crop in both districts (88.6% and 69.2%) followed by sunflower (75.3% and 57.0%) for Kilosa and Chamwino, respectively (Table 4). The third most commercialised crop for Kilosa was Cowpeas (59.5%) and Groundnuts for Chamwino (53.8%). Judging from

production (about half a ton per household and number of households involved (over half of all households), Groundnuts is the most important commercial crop in Chamwino. Maize is most produced crop in Kilosa (about 3 MT per household) and sorghum is the most produced crop in Chamwino (1.2 MT per household). Despite the fact that these crops (Maize and Sorghum) are the most produced are lowly commercialised (32% and 13% respectively) meaning that they are mainly produced for own home consumption.

Table 4: Production and percentage of crop marketed by district

Crops	Districts					
	Kilosa (447)			Chamwino (448)		
	Mean prod in Kg (SDV)	Selling		Mean prod in Kg (SDV)	Selling	
		Obs. (out of 447)	%kg sold (SDV)		Obs.(out of 448)	%kg sold (SDV)
Cowpeas	22.4 (160.8)	29	59.5 (32.2)	5.7(34.2)	35	19.7 (25.1)
G/nuts	1.1 (23.7)	1	60 (0)	486.7(5041.9)	241	53.8(10.2)
Maize	3112.1(29027.7)	416	32.9(24.58)	39.7(178.1)	124	12.2(13.9)
Millet	6.7 (52.9)	10	40.5 (33.08)	23.96(101.4)	44	9.9 (7.3)
Simsim	263.9 (1184.3)	207	88.6(13.9)	19.8 (92.7)	73	69.2 (19.8)
Sorghum	17.1(121.8)	16	16.8 (21.5)	1214.6(19281.0)	159	13.3 (13.7)
Sunflower	25.6(148.0)	20	75.3(19.6)	91.4(957.0)	130	57.0(15.2)

*SDV = Std. Dev

Furthemore, the commercialization analysis was extended to illuminate the distribution of farmers at different level of commercialization. The analytical approach involved conceptualisation of two groups of smallholder farmers, subsistence and commercial. But to understand the level on the commercialization ladder, two subgroups were developed for subsistence (subsistence and emergent) and commercialised (subsistence-commercial and commercial) smallholder farmers. Subsistence farmers were the lowest quarter in the commercialisation spectrum (0-25%), followed by second (25-50%) regarded as "emergent". Subsistence farmers can pass a season without interacting with market at all, while emergent will interact even though it is at minimum. In commercial groups, subsistence-commercial normal interact with market but they will not sell everything (50-75%). Some literatures indicate that these are surplus producing, as their rate of participation depends on the surplus they generate. Commercial farmers are the ones that they typically produce for market, ready to sell everything they have produced. Figure 1 shows the comparison of each commercialisation level in the district (meaning each level totals 100%).

While emergent farmers are roughly equally distributed in both districts, there are few more subsistence farmers in Kilosa district (60%) than in Chamwino district (40%). Having roughly equal emergent farmers explain the importance of markets to smallholder farmers. Farmers needs to sell something in the market to earn money required to command other bundles of goods and services from the markets. It attracts an attention for more investigation to understand as why the level market participation is still low. The semi-arid Chamwino district has the lowest percentage of commercialised farmers (about 20%).

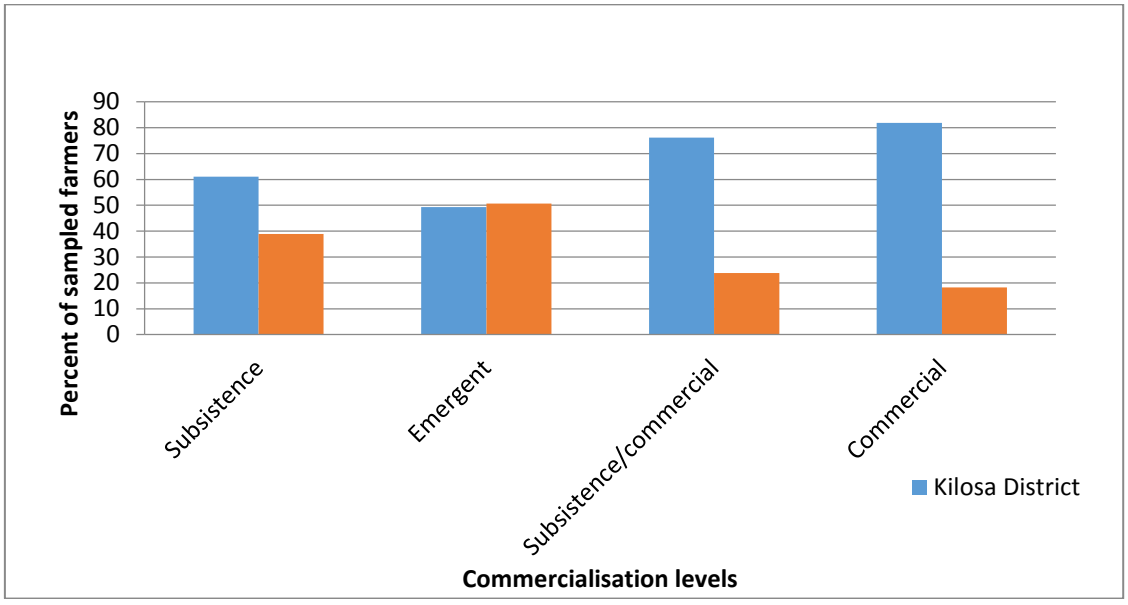

Figure 1: Commercialisation levels distribution in case study districts

3.4 Crop storage for deffered sales and consumption

After establishing commercialisation levels for important crops, it was worth investigating storage behaviour to iron the storage intentions by farmers – whether for deffered sales or future consumption (Table 5). For major food crops, farmers depended on storage for their food security. Most of food crops including maize, millet and sorghum were stored in hundreds of kilograms for consumption (306, 205 and 185 kgs respectively) mainly for future consumption. For respective crops, relatively smaller volumes kept for deferred sales (i.e. 244, 31 and 35 kgs). It seems farmers are not trusting that markets can be smooth enough to supply food throughout. While this calls for more research to find out if markets are integrated and if effective at local level, also it is a wakeup call for policy makers to attach storage practice in the study area as a part of food security intervention.

Table 5: Crop storage for deffered sales and future consumption

Crop type	Quantity (Kgs) stored					
	For Consumption			For Selling		
	Obs.	Mean	S.Dev	Obs.	Mean	S.Dev
B. Millet	343	188.75	238.06	347	17.69	64.45
Cowpeas	57	65.07	296.42	57	40.14	90.12
G/Nuts	243	59.59	86.65	244	66.41	239.39
Maize	543	306.66	383.12	543	244.63	635.57
Millet	52	205.63	243.42	52	31.37	97.08
P. Peas	47	26.05	38.21	47	94.11	203.7
Rice	65	200.11	148.25	65	252.46	552.58
Simsim	218	5.78	33.67	220	333.78	1403.02
Sorghum	174	185.43	227.73	176	35.81	136.5
Sunflower	142	74.25	176.38	144	56.47	201.92
Bambara Nuts	118	54.31	98.72	121	19.41	96.39

3.5 Relationship between commercialisation and wealth status

Again, to get a glimpse of which crops if commercialised could likely improve the wealth status of these farmers, correlation analysis was conducted. Generally, commercialisation is positively correlated to wealth status (Table 6). This suggests the possibility that commercialisation can contribute to poverty reduction and improved well-being of poor farmers through asset accumulation. The highest positive correlation coefficients were for simsim, tomatoes and pigeon peas. Households cultivating these crops are likely to more commercialized and wealthier. Interestingly, households cultivating pigeon peas are likely to be even wealthier. On the other hand, food staples (maize, millet and sorghum) are negatively correlated to general commercialisation. This requires further investigation as it means producers of these crops are less likely to commercialise. The government of Tanzania has always been sceptical about total commercialisation of food crops especially maize.

Table 6: Relationship between crops commercialisation and wealth status

Correlation	CCI	WI	Cowpeas	G/nuts	Maize	Pigeon peas	Simsim	Sorghum	Sun flower	Tomatoes	Millet
CCI	1.0000										
WI	0.0963*	1.0000									
Cowpeas	0.0188	0.0096	1.0000								
G/nuts	-0.0552	0.0202	-0.0150	1.0000							
Maize	-0.0906*	-0.0053	-0.0075	-0.0090	1.0000						
Pigeonpeas	0.1054*	0.1011*	0.2186	-0.0208	-0.0053	1.0000					
Simsim	0.1785*	0.0095	-0.0020	-0.0180	-0.0045	0.0015	1.0000				
Sorghum	-0.0825	-0.0142	-0.0056	0.7630	-0.0053	-0.0118	-0.0018	1.0000			
S/flower	-0.0055	0.0072	0.0259	0.7769	-0.0069	0.0145	0.0036	0.2344	1.0000		
Tomatoes	0.1373*	0.0190	0.0149	-0.0076	-0.0038	-0.0183	0.0014	-0.0062	-0.0007	1.0000	
Millet	-0.1046*	-0.0133	-0.0176	0.0316	-0.0130	-0.0348	-0.0245	-0.0100	-0.0141	-0.0144	1.00

CCI=All Crops Commercialisation Index; WI = Wealth Index

4. CONCLUSIONS AND IMPLICATIONS FOR POLICY

To bring added value in agricultural food systems through smallholder agricultural commercialisation in the dryland semi-arid and subhumid rural areas is a challenging but feasible endeavour. The risks drawing back surplus production for market and food security are common – inclunding climate change and variability, micro-credit failure, and low assets base.

Building the capacity of smallholder farmers to cope and adapt with climate change is critical to ensure these farmers commercialize to reap advantages offered by the market economy. Rural micro-finance is in tartars with less than 7% having access to formal and informal micro-credit services. This is reinforces with limited savings to erode the capital capability of these farmers. Market engagement by smallholders requires a working micro-finance system, which is seamlessly available to majority.

The semi-arid Chamwino district hosts majority of the poorest of the poor. These are almost subsistence with limited linkages with markets. Indeed, commercialization endevour provides a headway out of such distitution and misery. Public transfers which has been a practice is not a sustainable way of ending poverty and food insecurity in the Chamwino as other semi-arid areas of Tanzania that have been lifetime recipients of government food aid. Reducing production risk and increase the share of the local produce that find ways into profitable market outlets is a promising pathway. The same pathway holds for the sub-humid locale which also host a countable number of poor farmers despite of its production potential.

Gemerally, this study sheds more light on the thesis claimed literature that low level of commercialisation leads to poverty and food insecurity. Chamwino has the lowest commercialisation level for all crops, with millet/sorghum the crop that almost every household produces having only 10-13% reaching market. In oder for farmers to produce food crops for markets, they should have their incomes diversified, access to information on markets so as to plan on what to produce, how to add value, when to sell and capacities to manage production risks associated with vagaries of weather.

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