



AFRINT II TANZANIA MICRO REPORT



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AFRINT II MICRO REPORT

1. Household Demographic and Socio-economic characteristics

A total of 408 households were sampled for the second face of AFRINT. Of these around 65 percent were re-interviewed AFRINT I household; 5 percent were AFRINT I sample descendants and the remaining 30 percent were new households. Migration to other regions, and death of the household head/farm manager were the major cause of low retention of AFRINT I households. Migration into the sampled villages was very minimal with only seven new sampled households being migrants. Of these two household migrated from urban areas, four from other regions and one immigrated from within the region.

Table 1: Distribution of Households by Location

Region	Districts	Division	Ward	Village	Households
Iringa	Iringa	Mlolo	Ifunda	Ihemi	38
		Kilolo	Ukwega	Isele	42
		Mazombe	Uhambingeto	Kipaduka	41
	Mufindi	Kasanga	Kasanga	Kasanga	40
		Ifwagi	Rungemba	Kitelewasi	41
Morogoro	Kilombero	Ifakara	Idete	Idete	39
		Mang'ula	Mkula	Katurukila	43
			Kiberege	Kiberege	43
		Mngeta	Mbingu	Mbingu	42
		Mchombe	Njagi	39	
Total					408

Fifty eight percent of all households were nuclear families while 26 percent were extended families. About 9 percent of all households were female headed (de jure and de facto female headed), with more in De jure female headed households Iringa (10.4) than in Morogoro (3.9). There is a strong correlation between household head and the farm manager. The average age of respondents was 45 years with an average of five schooling years.

Table 2: Sex of head of household (Percentage)

	Morogoro (n=206)	Iringa (n=202)	Total (n=408)
Male	85.0	82.2	83.6
Female	15.0	17.8	16.4

2. Farm and Crop Management of Major Staple Food Crops

2.1. Crop Choice and Preference

The most important food crops were maize and rice. Nearly all (99.5%) respondents in Iringa grew maize while 77.7 percent in Morogoro grew maize. Overall about 88.5 percent of all households grew maize. This is more or less similar to 2002 results where 89 percent of all respondents grew maize. Rice was grown by 47.5 percent of all sampled households, with 94 percent of households in Morogoro and only 1 farmer in Iringa growing the crop. Around 48 percent of all households grew other food crops and vegetables. Comparing the two regions, to a large extent (68.8%) Iringa households involved themselves with other

food crops and vegetables compared to Morogoro households (27.2%). Apart from growing other food crops and vegetables, a few respondents (17.6%) grew non-food cash crops. Compared to 2002 study results, households involved in other food crops and vegetables, and those involved in non-food cash crops have dramatically declined. The decline was sharper for other food crops and vegetables (41.5 % overall change) compared to the decline in non-food cash crops (Table 3).

Table 3: Patterns of crop cultivation in 2002 and most recent season (%)

	Other food crops and vegetables				Non-food cash crops			
	Reference Year	2002	Most recent season	Change	Reference Year	2002	Most recent season	Change
Morogoro	46.2	81.4	27.2	(54.2)	6.5	15.6	12.6	(3.0)
Iringa	84.1	97.1	68.8	(28.3)	31.4	50.0	22.8	(27.2)
Whole	65.8	89.3	47.8	(41.5)	19.1	30.0	17.6	(22.4)

2.2. Maize production, Marketing and technology

2.2.1. Land area under Maize

Fifty eight percent of households grew maize in pure stand only while around 42 percent intercropped with other crops. Comparing the two regions, farmers in Iringa (48.8%) intercropped maize compared to 32.7 percent of farmers in Morogoro. Irrigation was minimally practiced in maize production. Overall, only 10 percent of households irrigated land under maize, with more households in Iringa (14.5%) than Morogoro (4.5%) doing so. Farmers who irrigated land with maize mostly grew only one crop per year. Only about 15 percent grew more than one crop per year. This indicates off season maize cultivation was minimal. This adds with the result showing sixty four percent of farmers had no other specific of land under maize. However 31 percent of farmers used the land under maize also for other crops including; other food crops (63%), vegetables (23%), and others (14%).

Area under maize production in most recent season ranged from 0.1 ha to 7.28ha. It averaged 0.874 ha per household. Compared to the season before the recent one and two seasons before the recent one, average land under maize has slightly decreased. Compared with 2002 land area under maize has decline by 13% (Table 4).

Table 4: Mean Area under maize (pure stand equivalent) (ha)

	(a)	(b)	(c)	(d)	(e)	(f)
	Most recent season	One season before most recent	Two seasons before most recent	Average three recent seasons (a), (b), (c)	2002 season	Percent change $[(d-e)/(e)]*100$
Morogoro	0.5362	0.5283	0.6417	0.5687	0.623	-8.72
Iringa	1.1388	1.1274	1.2100	1.1587	1.351	-14.23
Whole	0.8744	0.8651	0.9641	0.9012	1.033	-12.76

2.2.2. Maize Production and Utilization

Maize output is significantly higher in Iringa compared to Morogoro. This was mostly due to larger land under maize in Iringa (Table 5). Compare to 2002 mean household maize production has increased during the most recent seasons. Overall 53 percent of total harvested maize was used for home consumption, 38

percent was sold, about 3 percent was used for payment of hired labor and the remaining 6 percent was used in other ways. In Morogoro more maize was used for household consumption (57%) compared to Iringa (52%), which sold more maize (39%) than Morogoro (35%).

Table 5: Mean Maize production (kg)

	(a)	(b)	(c)	(d)	(e)	(f)
	Most recent season	One season before most recent	Two seasons before most recent	Average three recent seasons (a), (b), (c)	2002 season	Percent change [(d-e)/(e)]*100
Iringa	1360.83	1376.10	1716.44	1484.46	1341	10.70
Morogoro	584.72	666.20	904.19	718.37	560	28.28
Whole	1028.53	1070.08	1370.80	1156.47	1004	15.19

Farm managers carried out 67 percent of workload involved in producing most recent maize harvest. Apart from the farm manager spouses were the most important person involved in maize production followed by male household members.

2.2.3. Maize Technology and Inputs Use

Although about 10 percent of households irrigated land under maize, most irrigated $\frac{1}{4}$ to $\frac{1}{2}$ of the land under maize, suggesting very small irrigation scale. Adoption of hybrid and improved seeds was minimal among sampled farmers. Overall, 73 percent of all sampled farmers planted traditional seeds during most recent season. Only about 10 percent and 17 percent planted hybrid and improved varieties respectively. Comparing the two regions, only 13 percent of Morogoro sampled farmers used improved and/or hybrid seeds compared to 37 percent of sampled farmers in Iringa. Majority of farmers (64 %) acquired maize seeds from own stock, while other acquired from other farmers or neighbors (12 %), purchased from the market (20.7 %), and from extension agents, NGOs' (3.2 %) respectively.

Twenty one percent of sampled farmers used artificial fertilizer during the most recent season. On average farmers spent a total of USD 44.45 on artificial fertilizer to be used in maize farms. The amount spent by farmers on artificial fertilizer differed significantly between the two regions, with Iringa farmers spending higher than Morogoro counterparts (Table 6). Comparing use of artificial fertilizer during most recent harvest with that used in 2002 season, 12 percent of sampled farmers indicated the amount of fertilizer used has decreased, while 10 percent indicated the amount used has increased. Nine percent think the amount has not changed while 69 percent did not applied artificial fertilizer. What is apparent is that significantly more farmers in Iringa (16 %) indicated the amount of fertilizer used has increased compared to 1.4 percent in Morogoro. This might be a result of the government fertilizer subsidy program carried out in the Southern Highlands.

Table 6: Costs incurred for artificial fertilizer during the most recent season (USD)

	N	Mean	Std. Dev.
Morogoro	2	14.28	13.83
Iringa	84	45.17	49.49
Whole Sample	86	44.45	49.16

Overall 43 percent of sampled households used pesticides on maize during the most recent harvest. Significantly more farmers in Iringa (73 %) used pesticides compared to farmers in Morogoro (3 %). Land preparation for maize during the most recent harvest was mainly done by hand hoes (75 %) compared to other means such as oxen ploughing (22 %), and tractor ploughing (3 %). Comparing the two regions, Morogoro farmers used mainly used hoe cultivation (96 %) compared to Iringa (59%). Use of oxen ploughing was mainly limited to Iringa (39 %) compared to less than one percent usage in Morogoro.

Table 7 shows various technologies used/applied during the most recent season. With exception of zero-tillage, all other technologies/agronomic practices were more used in Iringa compared to Morogoro. In general, zero-tillage; intercropping; intercropping with nitrogen fixing crops; use of pesticides and improved planting practices were the most used technologies in maize production during the most recent harvest respectively.

Table 7: Technology used/applied in maize production during most recent harvest (%)

Technology	Morogoro	Iringa	Whole sample
Used Crop rotation	15.0	49.0	34.2
Intercropped	41.8	70.4	58.0
Intercropped with nitrogen fixing crops	25.8	62.8	46.9
Applied Fallowing	10.5	33.7	23.6
Applied Improved fallowing	.0	4.0	2.3
Used Animal manure	2.0	43.4	25.4
Applied Zero or minimum tillage	60.1	60.1	60.1
Used Green manure/compost/residue incorporation	26.3	48.2	38.7
Applied Soil and water conservation	15.8	27.8	22.6
Applied Improved planting practices	27.5	54.8	42.9
Applied Integrated (Soil) Nutrient Management (INM)	.7	6.1	3.7
Applied Integrated Pest Management (IPM)	1.3	3.0	2.3
Applied Agro forestry	4.6	21.2	14.0
Used Pesticides/herbicides	8.1	69.7	43.4

2.2.4. Maize marketing conditions

Fifty two percent of maize farmers sold maize following the most recent harvest. About 39 percent of farmers and 56 percent of farmers in Morogoro and Iringa respectively sold maize. Compared to 2002, the percentage of sampled farmers who sold maize has increased. A closer look however shows the overall increase in households that sold maize shadow the drop of the same in Morogoro. Whereas in 2002 season 49 percent of farmers in Morogoro sold maize, following the most recent harvest that percent has dropped to 39 percent. In Iringa the reverse is true, where the percent of farmers who sold maize increased from 42 percent in 2002 season to 57 percent following the most recent harvest. Averaging three most recent seasons, Iringa farmers sold more maize compared to farmers in Morogoro (Table 8). Both average amount of maize sold during the three most recent seasons and maize prices have increased compared to 2002 season.

Table 8: Total amount of maize sold and maize prices

	Most recent harvest	Before most recent harvest	Two seasons ago	Average 3 recent seasons	2002 season	Lowest price	Highest price
Morogoro	518.19	489.42	621.06	542.89	411.39	11.98	19.29
Iringa	1007.12	918.51	1275.21	1066.947	962.93	13.84	20.13
Whole sample	834.21	766.35	990.27	863.61	707.18	13.16	19.80

Maize quality had minimal impact on price offered by traders. Sixty percent of farmers indicated trades did not paid a lower price to their produce as a result of post-harvest quality deterioration. Only 6 percent of sampled farmers who sold maize indicated they received a lower price for most of their produce due to post-harvest quality deterioration. Quality control though rewarding the best quality with higher prices is important incentive for higher quality maize produces. The main market outlets for maize in the two regions were: at farm gate (71 %), in the village market (22 %), in market outside the village (6 %) and one percent in others. Price uncertainties remain very high in the maize market. Without contractual agreements farmers are not assured of next season price and thus tend to produce just enough for subsistence. Only 3 percent of sampled farmers grew maize on the basis of a pre-arranged contract with private traders. And all these farmers (3 %) are from Iringa region.

2.3. Cassava production, Marketing and technology

Cassava area under cultivation

Cassava was grown by 8 percent (or 31) of all sampled farmers. Most farmers who grew cassava were from Morogoro region with only 2 farmers in Iringa region. There seem to be a decrease in the number of farmers growing cassava compared to 2002 season where 21 percent of the sampled farmers grew cassava. In 2002 there was more cassava growers in Iringa compared to only 6 from Morogoro. Not only had the number of farmers growing cassava declined but so was the average area under cassava. The average area under cassava during the most recent harvest was 0.221 ha compared to 0.267 ha in year 2002. Overall 61 percent of farmers intercropped cassava with other crops, while 39 percent grew cassava in pure stand.

Cassava Production and Utilization

Farm managers undertook about 63 percent of cassava production workload. Farm manager spouse (58 %), other male members of the household (33 %) and other female members of the households (9%) shared the workload. Seventy percent of households which grew cassava utilized it for home conception. Only 20 percent of households growing cassava sold.

Cassava technology and inputs

Although the use of improved technology was low in cassava production, it has somewhat improved compared to year 2002. In year 2002 no household was reported to be using pesticides while in most recent season at least one farmer growing cassava applied pesticides. In most recent season intercropping was practiced by 46 percent of all households growing cassava compared to 36% in 2002. Households that used green manure or compost had increased from 19 percent in 2002 to 25 percent in most recent season. Thirty two percent applied soil and water conservation techniques, 20 percent used improved planting practices. However, cultivation of cassava has remained 100 percent hand hoe.

Cassava Marketing conditions

The number of households participating in cassava markets has slightly increased in most recent season compared to year 2002. In 2002 46 percent of respondents sold some cassava compared to 47 percent in the course of the past year. All households who sold cassava in the course of the most recent year sold them in the tuber form. This was also the case in 2002. Cassava was mainly sold within the village. Eight five percent of households growing cassava sold at farm gate, 10 percent sold in the village market and 1 farmers sold cassava outside the village. None of the households which sold cassava had a pre-arranged contract with private traders. As in maize, traders in cassava only minimally differentiated prices due to quality of produce. About 25 percent of farmers selling cassava indicated that traders paid a lower price for some produce due to post-harvest quality deterioration. Table 9 shows the amount of cassava sold in the three recent seasons and prices farmers received. There was a significant difference between the lowest price and highest price the farmer received.

Table 9: Amount of cassava sold (tuber equivalents (kg)) and Price (USD/100Kg)

	N	Mean	Std. Deviation
Most recent year	16	855.63	1078.82
Year before last	16	8.88	6.29
Two years ago	12	13.56	9.75
Lowest price	16	8.88	6.30
Highest price	12	13.56	9.75

2.4. Rice Production, Marketing and Technology

2.4.1. Paddy area under cultivation

Rice was the second most important staple food crop after maize. This was mostly in Morogoro where 95 percent of sampled households cultivated paddy compared to only 1 farmer who cultivated paddy in Iringa. Paddy cultivation was mostly dependent on rainfall. However 17 percent of households cultivating paddy during the most recent season irrigated land under paddy. This however didn't result to multiple crops. Only 4 percent of households which irrigated indicated they grew more than one rice crop per year. In addition to rice production households cultivating paddy used land area under paddy for other crops (13 %), grazing (0.6%) and other uses. Sixty nine percent of farmers who irrigated land under paddy used the land for other food crops after paddy was harvested. Thirty one percent put the land into other uses. The area under paddy leading up to most recent harvest averaged 0.92 ha. Compared to 2002 season mean area under rice production has slightly decreased (Table 10).

Table 10: Mean Area under Paddy (ha)

	Most recent harvest	One Season before most recent	Two seasons before most recent	2002 season
N	189	191	186	194
Mean	0.92	0.93	1.07	1.02
Std. Dev.	0.56	0.62	0.84	0.73

2.4.2. Rice Production and Utilization

The annual total paddy production in the most recent harvest averaged 1.37 tons per household. Average household paddy production has declined in the last three recent seasons (Table 11). Fifty five percent of the harvested paddy was sold. The remaining was used for home consumption (35 %), paying hired labor (5 %) and others uses (5%). Although on average household produced less paddy during most recent season compared to 2002, comparing a three year average with 2002 production has increased. The percent of paddy sold has also increased from 49 percent in 2002 to 55 percent during most recent season.

Table 11: Paddy production (kg)

	(a) Most recent harvest	(b) Harvest before most recent one	(c) Two seasons ago	(d) Three-year average (a), (b), (c)	(e) 2002 season	(f) Percentage change $((a)-(e))/(a)*100$	(g) Percentage change $((d)-(e))/(d)*100$
N	193	191	183	-	193	-	-
Mean	1370.26	1867.99	2270.65	1836.30	1577.00	-15.09	14.12
Std. Dev.	1348.21	1777.37	2206.16	1777.25	2550.00	-	-

On average 64 percent of the workload in paddy cultivation is undertaken by farm managers. When required to indicate who are others most involved persons in paddy cultivation, 75 percent of farm manager indicated their spouses, 19 percent indicated other male members in the household and 6 percent indicated other female members in the household.

2.4.3. Rice Technology and Inputs Use

Eighty one percent of rice was grown as lowland rainfed rice. Upland rice accounted for 3 percent of rice grown, while the remaining 16 percent was grown as lowland irrigated rice. Most farmers (81 %) cultivating paddy used traditional rice varieties compared to 19 percent who indicated they used improved varieties. A correlation analysis result showed there was a positive significant ($p>0.01$) correlation between farmers who had grown rice as lowland rainfed rice with households using traditional rice varieties. Also between households practicing lowland irrigated rice with use of improved rice varieties. This could be due to the fact that traditional varieties are most adapted to local conditions (including variable rainfalls) thus more suitable for lowland rainfed rice. Households practicing lowland irrigated rice have increased from 1 percent in 2002 to 16 percent during most recent season. This could somehow explain the increase in average household paddy production.

Only 1 farmer had cultivated NERICA or NERICA descendants. The major source of paddy seeds was own stock (76 %). Other means of acquiring seeds included: other farmers (13 %), market place (7 %) and 4 percent purchased seed from extension agents and or NGOs. The use of artificial fertilizer in paddy cultivation during most recent season has not changed compared to 2002 season. Cost incurred by households to purchase artificial fertilizer ranged from 12 to 80 USD and averaging 36.52 USD. Perception of farmers on amount of artificial fertilizer compared to 2002 showed a mixed picture. Four percent, 2 percent and 9 percent believed amount of fertilizer used has increased, decreased and remained the same respectively.

Seventy one percent of households cultivating paddy applied pesticides during the season preceding the most recent harvest. Main method of land preparation was hoe cultivation used by 81 percent of households and tractor cultivation used by 19 percent of farmers cultivating paddy. The correlation analysis results showed a positive significant relationship between households which practiced lowland irrigated rice and households using tractors as main means of land preparation. A combination of improved varieties and irrigation ensures good harvest for farmers. With irrigation, they need special tractors to make sure they can incorporate as much oxygen into the water logged soil before planting. Also due to assured good harvest they could afford to use tractors. Application of green manure and use of improved planting practices were among improved technologies used by rice farmers in most recent season (Table 12).

Table 12: Technology used/applied in paddy cultivation

Technology	Frequency	Percent
Pesticides/herbicides	99	54.4
Zero or minimum tillage	94	51.6
Breaking the hard pan	51	27.7
Green manure/compost/residue incorporation	41	22.4
Improved planting practices	32	17.6
Soil and water conservation (level bunds, grass strips, terracing etc.)	28	15.3
Fallowing	21	11.5
Crop rotation	16	8.7
Intercropping	6	3.3
Agroforestry	4	2.2
Improved fallowing	3	1.6
Integrated Pest Management (IPM)	3	1.6
Intercropping with nitrogen fixing crops (beans etc.)	2	1.1
Animal manure	2	1.1
Integrated (Soil) Nutrient Management (INM)	2	1.1

2.4.4. Rice Marketing conditions

Above three quarter of households which cultivated paddy in most recent season sold or intend to sell paddy. This high percentage participation in paddy market indicated the growing importance of rice as a cash crop. Table 14 shows amount of paddy sold during three most recent seasons and compares it with 2002 season. Amount of paddy sold has increased by 17 percent compared to 2002. There was a significant difference between the lowest and the highest price farmers received. Prices received for paddy sales have also increased in the most recent season compared to 2002 (Table 13). Forty three percent of farmers however received much lower prices from paddy traders as a result of post harvest quality deterioration.

Table 13: Mean prices paddy farmer received (USD/100kg)

Price USD/100 kg	Most recent season	2002 season
The lowest price	16.18	12.74
The highest price	23.18	9.14

Table 14: Paddy Sales (Kg)

	(a) Most recent harvest	(b) Harvest before most recent	(c) Two seasons ago	(d) 3-year average (a), (b), (c)	(e) 2002 season	(f) Percentage change $((d)-(e))/(d)*100$
N	141	142	161	-	49	-
Mean	896.29	1300.91	1460.75	1219.32	1007	17.41
Std. Dev.	1129.1	2143.07	1951.47	1741.21	1809	-

The number of households participating in paddy trade has remained above 70 percent in the past three recent seasons. Compared to maize, paddy production was more commercial oriented. Localized production of rice in a few regions in the country opposed to maize grown all over the country might explain the commercial orientation of rice production.

As was the case for maize, paddy was mostly sold at farm gate as indicated by 77 percent of households which sold paddy. Fifteen percent sold paddy at the village market while 8 percent sold in markets outside the village. None of the farmers sold through farmer organizations or groups thus reducing their bargain power. Contractual agreement with traders was also minimum with only 2 (or 1.3%) farmers indicating they had contractual agreements with private traders.

The increased use of improved technology, increase in households irrigating area under paddy and increased number of farmers participating in markets compared to 2002 is a positive trend towards transformation of the subsector.

2.5. Rural – Urban and Rural – rural linkages for staple crops

Twenty six percent of respondents sent staple crops (maize, cassava and rice) to relatives outside the village. Maize was the leading staple crop sent to relatives outside the village (Table 15). Twenty seven respondents indicated relatives from outside the village came to collect staple. Relatives receiving staple crops are from neighboring villages (27 %), other rural areas (15 %), towns in same district (14 %), and towns outside district (16 %), major urban areas (11 %) and capital city (17 %). Apart from staple crops, 20 percent of households indicated they also assist relatives with other crops too.

Table 15: Estimated total staples relatives collect or sent to them in a year (kg)

	N	Mean	Std. Dev.
Maize, amount	78	126.44	168.068
Cassava, amount	3	20.00	5.000
Sorghum, amount	9	46.44	40.676
Rice, amount	59	96.71	86.248
Total, amount	114	124.82	145.700

2.6. Farm and crop management other crops

2.6.1. Other food crops and Vegetables

Overall 58 percent of sampled households grew other food crops and vegetable crops last season apart from staple food crops. Beans, vegetables for local market and banana were ranked 1st (29 %), 2nd (25 %),

and 3rd (23 %) among other food crops grown by households. Other food crops grown by households during most recent season included; Irish potatoes (20 %), sweet potatoes (17 %), peas (15 %), groundnuts (8 %), fruits for local market (7 %), millet (5%) cocoyam and yams. Banana, groundnuts, fruits and cocoyam were mostly grown in Morogoro compared to Iringa.

Land area under other food crops averaged 0.54 ha per household with Iringa households having bigger mean area compared to Morogoro households (Table 16). In Iringa about 27 percent of households irrigated land area under other food crops while in Morogoro less than 1 percent did so.

Table 16: Other food crops land area under cultivation and irrigation

	Land area cultivated			Land area Irrigated		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Morogoro	73	0.41	0.79	4	0.27	0.22
Iringa	151	0.61	0.71	40	0.47	0.90
Whole sample	224	0.55	0.74	44	0.45	0.86

Use of improved technologies on other food crops was more prominent in Iringa. More than 85 percent of households which applied/used chemical fertilizer, animal manure, green manure and pesticides were from Iringa. Households which sold other food crops indicated banana (27 %), beans (26%) and Irish potatoes (12%) as the most profitable crops. In Iringa the most profitable other food crops were beans (36 %), Irish potatoes (15%) and banana (14%), while in Morogoro the most profitable other food crops were banana (59%), followed by vegetables (11.4%) and groundnuts (9%) respectively. Thirty six percent and more than a quarter of household indicated they are selling more and less of the most profitable other food crop respectively compared to when the household was established. Market access for the most profitable other food crop has improved as indicated by 64 % of households which sold other food crops. Only 6% of households indicated market access has deteriorated for the most profitable other food crop. Even when compared to 2002 more the half of the households indicated they sell more and market access has improved for the most profitable other food crop. In spite of the improvement in market access only 3 percent of households grew other food crops in pre-arranged contracts with private traders.

2.6.2. Non-food cash crops

Thirty one percent households cultivated non-cash food crops as an alternative source of household income. The most important non-food cash crops were sugarcane and cocoa grown by 4 percent and 2 percent of sampled households respectively. Other non-food cash crops cultivated were fruits and vegetables for export (1 %) and cotton grown by 1 farmer in Morogoro. None of the sampled households in Iringa indicated they grew coffee or pyrethrum in contrast to 2002 where 17 percent and 5 percent of respondents in Iringa grew the crops. Mean total land area under non-food cash crops was 3.4ha per household growing non-food cash crops. Only two farmers indicated they irrigated non-food cash crops.

Use of improved technologies on non-food cash crops was low. Whereas chemical fertilizer was used by 30 percent of households which cultivated non-food cash crops, animal manure was applied by 9 percent; green manure by 8 percent and 20 percent used pesticides. With exception of chemical fertilizer which was used slightly more by Morogoro households (52%) compared to Iringa (48 %), other improved technologies were more practiced in Iringa.

Farmers in Morogoro who cultivated non-food cash crops indicated sugarcane (70 %) and cocoa (20 %) were the most profitable non-food cash crops; while in Iringa spices (17 %) were the most profitable. More than half the household which sold non-food cash crops indicated that they sell more of the most profitable crop presently compared to 2002 and when the household was established. Sixty two percent and more than half of the households also indicated market access for most profitable non-food cash crop has improved compared to 2002 and when the household was established.

The farm manager carried out an average 70 percent of the workload in the production of non-food cash crops. However, spouses of the farm manager, other male and female members of the household also were involved respectively. Gender seemed to play a role on who should have responsibility over the most profitable non-food cash crop. In Morogoro 63 percent of households cultivating non-food cash crops indicated that if one sex (men or women) was responsible for the most profitable non-food cash crop the other sex are responsible for another cash crop. In Iringa 40 percent indicated the other sex was responsible for another crop.

2.7. Agricultural Techniques

Overall more than half of farm managers had enough knowledge on multiple agricultural techniques such as crop rotation, intercropping, intercropping with nitrogen fixing crops, fallowing, use of animal manure, zero or minimum tillage, green manure, and chemical fertilizer. Other technologies farm managers indicated to have enough knowledge about were soil and water conservation, improved planting practices, pesticides/herbicides and irrigation. However, a few farm managers indicated they had enough knowledge on Integrated (soil) Nutrient Management (INM) (7%), Integrated Pest Management (IPM) (11%), rain water harvesting (12%), improved fallowing (19%) and Agroforestry (34%). Knowledge about these techniques was significantly lower in Morogoro compared to Iringa, with exception of rain water harvesting technique.

Although many farm managers had indicated enough knowledge on multiple agricultural techniques only a few indicated they actually practiced the techniques. Apart from rain water harvesting technique in which more than half of the farm managers practicing it were from Morogoro, all other techniques mention above were practiced more by farm managers from Iringa. Overall the most practiced techniques were intercropping (58%), zero or minimum tillage (58%), use of pesticides/herbicides (57%) and intercropping with nitrogen fixing crops (44%). The least practiced techniques were rain water harvesting (1%), IPM (3 %), INM (3%) and improved fallowing (4 %). Farmer indicated extra cost, labor consuming and not finding the technique relevant as three most important reasons for not practicing techniques respectively.

Major source of knowledge for agriculture techniques was from parents/family members and from an extension agent/NGO/ other formal organizations. Farmers who had enough knowledge on the least practiced techniques acquired the knowledge mostly from an extension agent/NGO/ other formal organizations with exception of IPM technique which most acquired knowledge from parents/family members. For the most practiced techniques farmers (45%) acquired knowledge from parents/family members. This indicates mostly cost free techniques handed down through generations were most practices compared to techniques which needed extra personal effort to acquire. About three quarters of farmers indicated they acquired knowledge on various techniques more than five years ago. Five percent

indicated they acquired knowledge on various techniques within the last year. This somehow shows the decline in extension services in recent years.

Forty three percent of farmers used bags/tarpaulins/mats to dry produces. Other means of drying produces included drying on the ground (32%), tarmac road drying (4%) and other techniques (21%). On the ground drying was the most popular (52%) drying technique in Iringa while farmers in Morogoro mostly (73%) used bags/tarpaulins/mats. Eighty percent of farmers stored produces in bags and inside the house. Other stored in granary (12%), and in bags in a proper store (4%). Eighty percent of farmers who stored produce in bags inside the house, bags were put on pallets to allow for air circulation. Eleven percent put bags straight on the floor, 3 percent put bags under the ceiling and the remaining 6 percent arranged in other ways. Overall half of the respondents used pesticides to protect stored produces. Comparing the two regions, 86 percent of farmers in Iringa used pesticides compared to only 15 percent in Morogoro. Overall during last season/year post-harvest storage losses averaged 13 percent. Thus investment in proper storage is crucial for food security and economic development.

2.8. Land Resources

Table 17 present the total cultivated area by households during the most recent season. Mean total area under cultivation ranged from 1.55ha to 2.11ha and averaged 1.83ha. Although the area under irrigation was small, households seemed to have enough land that could be put under cultivation when the need arises. More than half of households which irrigated, 76 percent in Morogoro and 49 percent in Iringa indicated community owned irrigation systems as main source of irrigation. Other sources of irrigation were private owned river diversion (17%), private owned wells (10%), government schemes (2%) and others (12%).

Table 17: Total household Land area under cultivation and irrigation (ha)

	Total cultivated area			Extra land that could be cultivated			Total Irrigated area		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Morogoro	202	1.55	0.91	121	1.50	1.41	23	0.99	0.85
Iringa	197	2.11	3.89	111	3.35	19.12	41	0.61	0.67
Whole sample	399	1.83	2.82	232	2.39	13.27	64	0.75	0.76

2.9. Livestock and fish

2.9.1. Livestock

Livestock plays a small role in the economics of sampled households in the two regions. The mean number of livestock owned per household was very small. With exception of camel/donkey and poultry households in Iringa had significantly number of animals compared to Morogoro (Table 18). Animals were mostly kept as a store of value. Whereas only 9 percent of households regularly sold animal produces (such as milk, eggs) 38 percent of households regularly sold animals and 5 percent used livestock for draught or transport. Livestock was mostly used for draught in Iringa than Morogoro. Sixty one percent of households grazed their animals on communal (open) grazing land and less than ten percent grazed animals on private grazing land. Stall-feeding was rare with only 3 percent of households practicing. The same as percentage as

households which indicated they cultivated fodder crops. Only 5 farmers in Iringa (or 15%) had graded, cross-breed cows a decline from 25 percent in 2002.

Table 18: Mean number of livestock owned per household

	N	Cows	Oxen	Goat/sheep	Camel/donkey	Pigs	Poultry
Morogoro	206	0.06	0.01	0.19	0.00	0.44	8.24
Iringa	202	1.02	0.31	0.77	0.01	1.23	8.19
Whole sample	408	0.54	0.16	0.48	0.01	0.83	8.21

2.9.2. Fish

Two and three percent of households in Morogoro and Iringa had fish ponds respectively. Overall 4 percent of households indicated they had access to fishing waters. In Morogoro 5 percent of households had access to fishing water compared to 3 percent in Iringa. Households which fished did so mainly for commercial purposes (47%), for own consumption (42%) and other reasons (11%).

2.10. Labor Resources

Table 19 shows labour resources in the household. The household size was 6 persons with children (≤ 15 years) being slightly more than adults (15-60 years). The dependency ration corresponded with the national figures. However Iringa had a higher dependency ratio compared to Morogoro. Compared to 2002 Morogoro dependency ratio has slightly decreased while it has slightly increased in Iringa. Above 90 percent of all households heads and farm managers indicated farming as main occupation. The percent of non-farm household head and farm managers was slightly higher in Morogoro. Household head who didn't work on the farm were either employed outside the farm or engaging in micro and or big businesses.

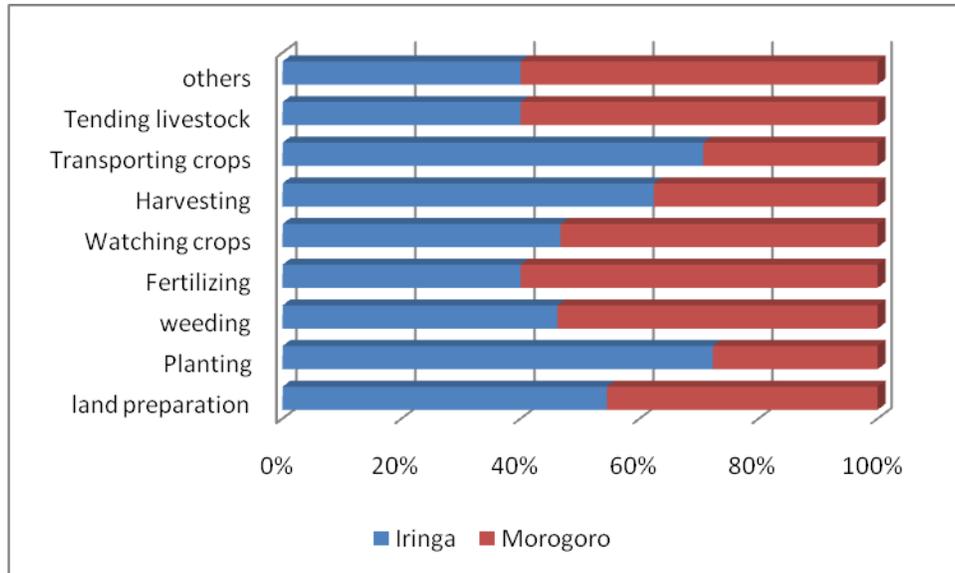
Table 19: Labour resources in a household

	N	Total household members	Adult members (16-60 yrs)	Children (≤ 15 yrs)	Old members (≥ 61 yrs)	Adult workers (16-60 yrs)	Dependency ratio
Morogoro	206	6.03	2.78	2.64	0.61	2.61	117
Iringa	202	5.55	2.38	2.72	0.45	2.74	133
Whole sample	408	5.79	2.58	2.68	0.53	2.68	124

About half of the households required assistance from outsiders to work on the farm (Table 20). Activities which most households hired labor included weeding, land preparation, planting, harvesting, and transport of crops respectively (Fig. 1). Hired labour requirement varied significantly between activities and between regions. Eighteen percent of households also used exchange labour. Exchange labour was mostly used during land preparation (57%), weeding (67%), planting (35%) and harvesting (33%).

Table 20: Non-farm income sources and dependence on non-household labour

	N	Adults employed outside the farm	Adult involved in micro business	Adults involved in large-scale business	Total adults involved in off-farm activities	Outsiders working in the farm
Morogoro	206	0.19	0.29	0.01	0.49	0.39
Iringa	202	0.16	0.38	0.00	0.54	0.31
Whole sample	408	0.18	0.33	0.01	0.52	0.35

*Figure 1: Tasks which hired farm labor performed*

2.11. Institutional Conditions

Although access to extension services and credit facilities and participation in farmer organizations were the most important institutional issues, over 60% and 70% of respondents had never received advice from government or non-governmental agent respectively. About a quarter farm managers rarely received advice during the course of last year while only 13 percent received advice regularly. Only 6 percent of farmers who received advice had paid for the service. This closely corresponds to the 7.6 percent of farmers who indicated they regularly received extension services from non-governmental extension agents.

Overall only 3 percent of households (20 percent in Iringa and 14 percent in Morogoro) were members to farmer associations. Seventeen percent of farmers had obtained agricultural inputs in the most recent season. Compared to 2002 both extension services and participation in farmer associations have deteriorated. However as far as credit is concern more households had received credit in the present year than 2002.

2.12. Income and Expenditure

2.12.1. Source of Income and Ownership of Assets

2.12.1.1. Source of Income

Overall 60 percent of households indicated sale of food staples generated most cash in the course of last year. The second major income source was sale of other food crops (13%) followed by micro-business (11%). There was however a significant difference between the regions. Eight one percent of respondents in Morogoro sale of food staples was the major source of income compared to 39 percent of household in Iringa. Sales of other food crops (22%), micro business (15%) and non-farm salaried employment (6%) were other major sources of income for households in Iringa. For households in Morogoro performance of food staples is thus central to food security. However in Iringa too, 61 percent of household depends on food crops (staples + other food crops). This emphasizes the importance of food crops in the fight to reduce poverty and achieve food security.

Sale of staple food was the first farm income sources which generated most cash for the household (Fig. 2). The second was sale of other food crops (22%) followed by sale non-food cash crops (6%). Sale of animal and leasing of machines were least farm sources of income for the household. Table 21 shows household income from various sources.

Table 21: Household income with respect to source (USD)

	Morogoro (n=206)	Iringa (n=202)	Whole sample (n=408)
Sale of food staples	137.71	75.76	107.04
Sale of other food crops	60.19	71.11	65.59
Sale of non-food cash crops	26.55	34.50	30.48
Sale of animals/animal produce	8.78	42.43	25.44
Leasing out machinery and/or equipment, oxen, push carts	4.28	7.16	5.71
Work on others' farms	5.23	4.98	5.11
Non-farm salaried employment	28.71	82.79	55.49
Micro business	197.39	133.49	165.75
Large-scale business	3.50	0.95	2.24
Rent, interest	3.90	2.60	3.25
Pensions	1.69	1.03	1.36
Remittances	0.82	8.95	4.84

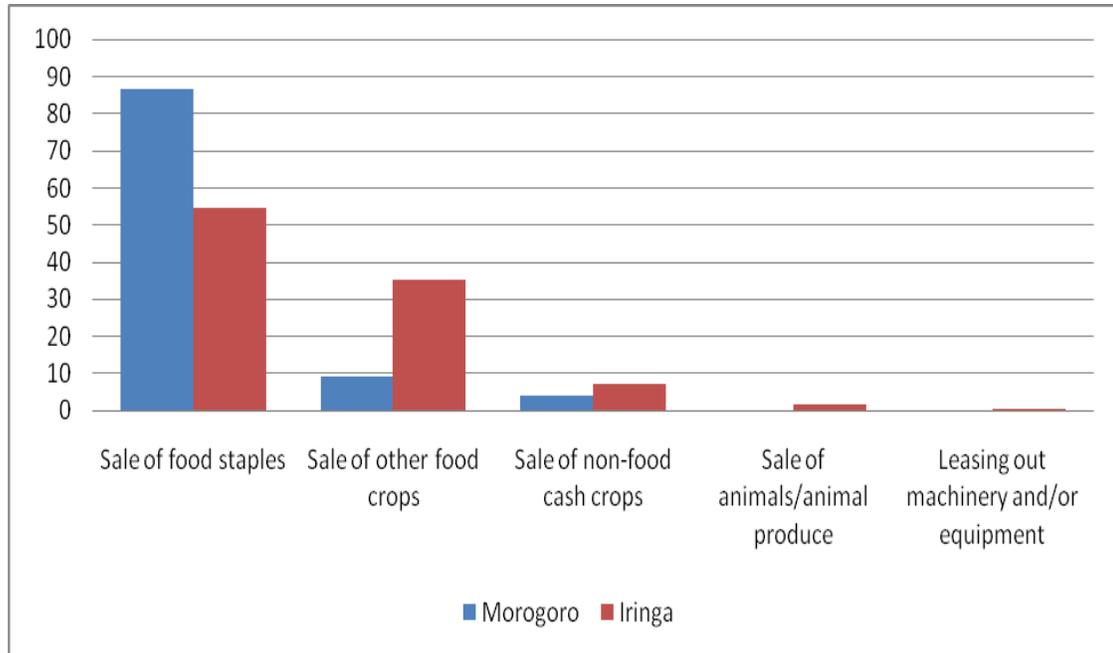


Figure 2: Farm Income sources that generated most cash (%)

2.12.1.2. Assets

Less than one or one percent of farmers had water pipe to the house and wired electricity respectively. Slight more than one percent had TV sets. However 76 %, 71 %, 61% and 16% had radio, bicycle, battery torch and kerosene stoves of modern stoves respectively. Twenty three percent of respondents had mobile/stationary telephone. This is a significant increase compared to 2002 when none of the respondents had mobile or stationary phones. Also 65 percent of those without mobile phones indicated they had access to telephone services. This indicates about 88 percent of all respondents had access to mobile/stationary phones. Generally apart from houses with wired electricity, generators and piped water pipes households with other assets have increased compared to 2002.

The most common advance means of own transportation were bicycle (57%) and head-loading on foot (41%). The remaining 1 percent used donkeys. Only 1 (0.5%) respondent each indicated motorbike and car as their most common means of own transportation respectively. Use of bicycle has increased by 17% compared to 2002 while respondents head-loading on foot have decreased by 10 percent.

Thirty percent of all houses were made of mud with thatched roof. Twelve percent were made of mud with corrugated iron roof and the remaining 58 percent were block/brick houses with corrugated iron roofs. This indicates household wealth has increased compared to 2002 when 52% of houses were made with mud and thatched, 20% with mud and corrugated iron roof and 27% of houses were brick houses. The proportion of households with brick houses was nearly the same between the two regions. This is a plus for Iringa which was behind in 2002.

Ranking the wealth of households with respect to capital assets and appearance in comparison with other households in the village indicated 58 percent of households were very poor or below average wealth. Thirty eight percent of household were ranked to have average wealth and the remaining above average wealth. Regional comparisons are presented in Fig. 3.

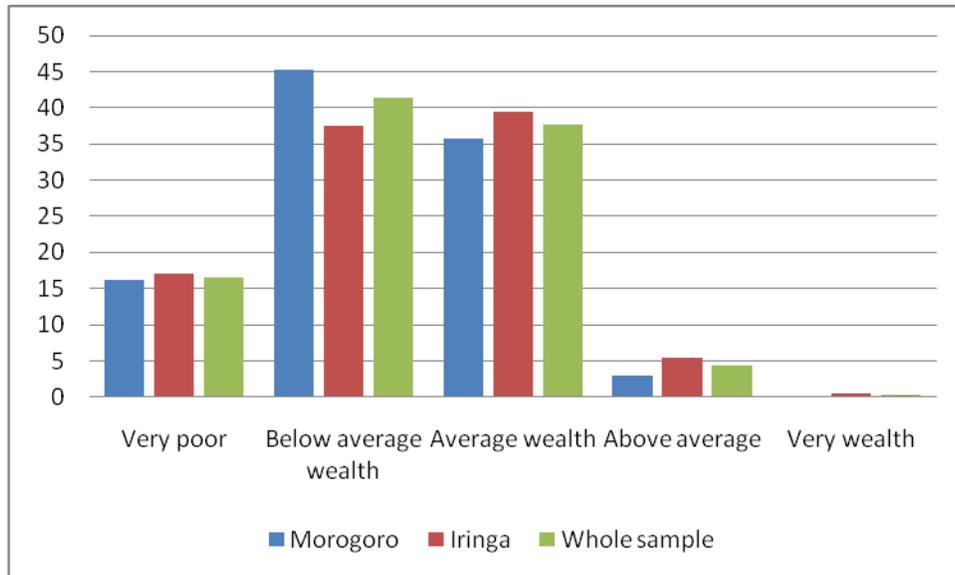


Figure 3a: Wealth ranking of households

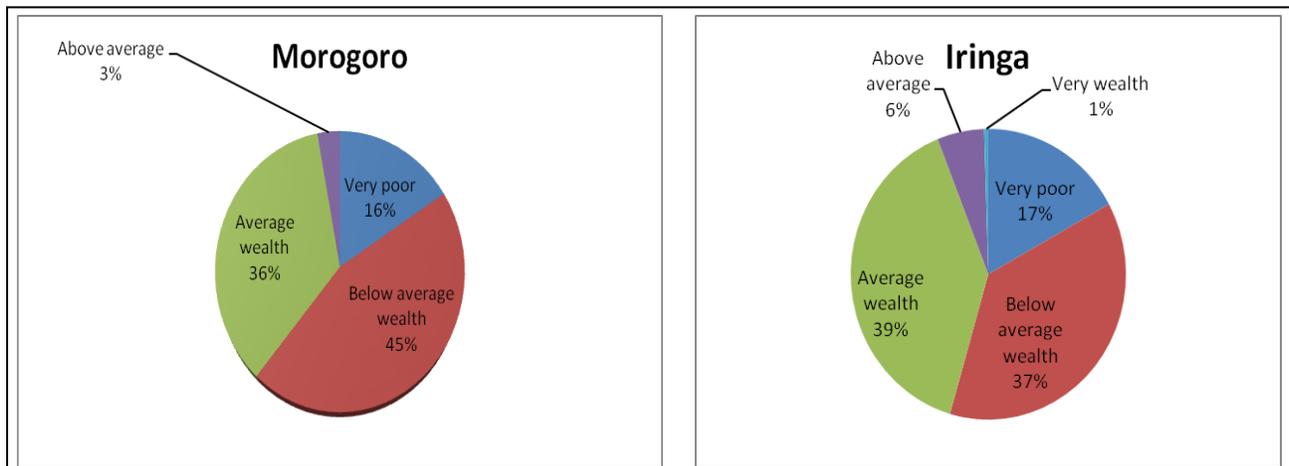


Figure 3b: Wealth ranking of households

2.12.2. Expenditure

2.12.2.1. Cost of purchased inputs

Overall at least 20 percent of all households had cash outlay on the various inputs and farm operations. Expenditure on chemical fertilizer (35%), and pesticides (34%) had more significant impact on household costs. Other expenditures with very significant impact were machinery/implement (23%), Transport (20%), land improvement measure (19%) and hired labor (22%). With exception to expenditure on machinery for land preparation and expenditure on transport Iringa all other above cost components were more important elements in Iringa than in Morogoro.

2.12.2.2. Food purchases

About 40 percent of the households reported buying maize in previous year although mostly in Morogoro (53%) compared to Iringa (28%). However rice purchases show a reverse picture with 86 percent of

households in Iringa buying and only 26 percent in Morogoro. Overall, households purchasing maize have decreased by 10 percent while those purchasing rice have increased compared to 2002. Other important crops purchased were beans (61%), vegetable (56%) groundnuts (37%) and Irish potatoes (39%). For all these crops Morogoro households significantly purchased more compared to Iringa households. Over 90 percent of households purchased meat and fish while 68 percent purchased milk. Only 33 percent of households purchased eggs.

Thirty eight percent of all households borrowed money to cover expenditure. Forty seven percent of household (60%) in Iringa and (38%) in Morogoro indicated they normally save money for future needs. Above 95 percent of the households had lunch and dinner during lean season and the rest of the year. Less household (73-75%) had breakfast throughout the year.