

Appendix 4

Fishers income calculations

Season 1=> (kusi in Zanzibar and habagat in Philippines) Season 2=> (kaskazi in Zanzibar and amihan in Philippines).

TSH= Tanzanian Shillings PHP= Philippines Pesos

A) GROSS INCOME calculations

Data extracted from Fisher Survey- Questions 1 Section 2 Survey Instrument Zanzibar & Question 1 Section 3 Philippines, Question 6,7 Section 1 Zanzibar & Questions 8,9 Section 1 Philippines.

Landings were given in many different units thus needed standardizing to KG per person per day the fisher was fishing

Acronyms

S= species

D= Day

A= Active

P=Person

V=Value

\$=International USD

GI= gross income

PPP= Purchasing Power Parity

1) Buckets, basins and individual species landed were converted to KG according the weight estimations given by fishers. If a respondent made no KG estimations then estimations from the same landing site for the same species/bucket/basin sizes were taken. This gave us- KG Landed Per Day Per Species Season 1= **KG1**; KG Landed Per Day Per Species Season 2=**KG2**

2) Next the "annual" average KG landed per day was calculated with the average KG landed per day in season 1 and average KG landed per day in season 2. This average was divided by the number of people (crew, captain) associated with the landing to give the **Average KG Landed Per Day Per Species Per Person (KGDSP)**

$((KG1 + KG2)/2)/\#Crew = KGDSP$

3) Fishers were asked to state the estimated amount of money (in local units) they themselves got in accordance with the landings they stated for each day per season. This excludes the need to deal with the "sharing system" (typical on most small-scale fishing vessels with more than one owner/captain) i.e. where part of the days profit goes to the vessel, the majority to the owner, some to the captain and relatively less to crew-only members. This value for season 1 (V1) and season 2 (V2) was averaged to get an "Annual" **Average Daily Value per Species per Person in TSH or PHP**; used in place of (but not the same as) a sales prices for the calculations.

$(V1 + V2)/2 = VDSP$

4) The local units (Philippines pesos and Tanzanian shillings) for the average value received per day (step 3) were then converted to international US Dollars with the appropriate purchasing power parity PPP conversion factors (Factfish 2016). This step gave the **Annual Average Daily Value Per Species Per Person in international Dollars**.

$(VDSP /PPP)= VDSP\$$

5) The **VDSP\$** was then divided by the "annual" average volume landed (KGDSP – step 2). As the values were associated with many different types of weight units and for two different seasons-> they were converted to per KG values with **KGDSP** to give an **Annual Average Daily Value Per Species Per Person Per KG in international USD**.

$$\text{VDSP\$} / \text{KGDSP} = \text{VKG\$}$$

6) Fishing effort is not evenly distributed across the year. This was accounted for to make sure gross income was accurate for the days the fishers were actually out fishing (and so as not to over-estimate the final incomes). This was done by getting the active days per year for individual fishers (Question 6,7 Section 1 – Zanzibar; Questions 8,9 Section 1 – Philippines). A season average was taken for the months, days and weeks to get the average numbers in the calculation. Active Months Per Year (M), Active Days Per Week (D), and the Average Weeks Per Month (W) were all multiplied to get Active Days Per Year for each fisher (DY).

$$M * D * W = \text{DY}$$

** This calculation was not included in the first set of calculations pre-may 2017

7) The value calculated in step 5 was converted to a standardized value for the **Average Value Per Year Per Species Per KG Per Person in international USD**.

$$\text{DY} * \text{VKG\$} = \text{VKGYS}$$

** This calculation was not included in the first set of calculations pre-may 2017

8) The yearly values from step 5 was then divided by the number of days a fisher was active throughout the year according to the effort data to get **Average Value Per Active Day Per Species Per KG Per Person in international USD**

$$\text{VKGYS} / \text{DY} = \text{VKGAS}$$

** This calculation was not included in the first set of calculations pre-may 2017

9) Finally the gross income was calculated by taking into account the quantities fishers were landing on average across the year on a daily basis, to get an **Average Value Per Active Day Per Species Per Person in international USD**

$$\text{VKGAS} * \text{KGDSP} = \text{VADSP\$}$$

10) The **VADSP\$** was summed for each individual fisher to account for the different species they were are landing. The **Final unit was an Annual Average Active Daily Gross Income Per Person in international USD**

$$\Rightarrow \text{GI\$}$$

OBS We assessed each species that fishers landed, however what they land on a daily basis varies according to many factors including season and weather and they can land multiple species on the same day. We chose to work at the species level to try and link the fishing activities and market to ecosystem dynamics. However separating the catch into species and then summing the final values will result in overestimation of fishers' earnings for some days. This can be seen in the positive skews of the boxplots in the paper.

If, on the other hand, an average volume landed was taken across all the different species a fisher was landing this resulted in a much bigger under estimation of the yearly catch. When running costs were brought into the calculations this then leads to many negative net incomes. After working through the different types of income calculations and assumptions we decided that the most accurate estimation of daily gross incomes was to sum the set of species.

B) RUNNING COST Calculations

Data extracted from Fisher Survey- Question 4a Section 2 Zanzibar & Question 4 Section 3 Philippines, Question 6,7 Section 1 Zanzibar & Questions 8,9 Section 1 Philippines.

Fishers' costs were given in many different time units (days, weeks, biweekly, 6 months, year etc.) thus the first thing was to standardize costs to the days that fishers were active. Running costs were taken as those costs that fishers incurred yearly or in any time span less than a year i.e. daily, weekly, monthly, and were separated from the bigger investment costs that fishers might make on a more-longer term basis.

1) The costs for the different time units the fishers used were converted into single unit costs as follows

Each cost (C) was identified individually as either a simple per unit cost i.e. per day, per week or per month; or if the costs were more or less than a simple unit e.g. per 3 weeks, twice a day. For example 50 TSH on salt 3 times per day, the unit was identified as day, the time unit as 3. The cost per day (Time Unit TU) was thus multiplied by 3 (Per Unit PU). If not a simple per unit cost then the costs were converted to get a **Cost Per Unit in TSH/PHP**

$$C * TU * PU = CPU$$

2) Costs were then checked to see if they were paid by the fisher, by the captain, the crew or the boat owner, which was captured in the surveys. "CPU" were then divided by the appropriate number; if the fisher didn't incur the cost it was divided by 0.

$$= CPUP$$

3) The days fishers were active and thus incurring costs were then brought into the calculations. The individual costs were converted into yearly costs.

Average # Weeks Per Month = W

Active Months Per Year = M

Active Days Per Week = D

If the costs was per

Year = $CPUP * 1$

Month = $CPUP * M * PU$

Week = $CPUP * M * W * PU$

Day = $CPUP * M * D * W * PU$

This step provided the **Cost Per Unit Per Person Per Year in TSH or PHP = CPUPY**

4) Similar to what was done for gross income, the yearly costs from step 3 were converted down to daily costs for days the fishers were actually active; the Active Days Per Year (DY) were taken from the gross income calculations to calculate a **Cost Per Unit Per Person Per Active Day in TSH or PHP (CPUD)**

$$(CPUPY)/DY = CPUD$$

5) Costs were converted to international dollar using the conversion factor PPP (see gross income costs) to get a *Cost Per Unit Per Person Per Active Day now in international USD*

$$(CPUD)/PPP = CPU\$$$

6) We then summed all the costs for each fisher to have a final running cost total per individual, so a **Cost Per Person Per Active Day in International USD**.

$$\Rightarrow C\$$$

C) NET INCOME calculations

The gross income values were used and the running costs taken away to give a **Net Income Per Person Per Active Day in international USD**

$$GI\$ - C\$ = NI\$$$

Trader income calculations

A) GROSS INCOME calculations

Data extracted from Trader Survey- Question 1a,b Section 2 Zanzibar & Question 1 Section 3 Philippines, Question 2a,b Section 2 Zanzibar & Question 2,3 Section 3 Philippines

Quantities trader were given in many different units thus needed standardizing to KG per person per day the trader was active

Acronyms

S= species

D= Day

A= Active

P=Person

V=Value

\\$=International USD

GI= gross income

PP= Purchase Price

SP= Sales Price

PPP= Purchasing Power Parity

1) Average buckets, basins and individual species traded daily were converted to KG according the weight estimations given by traders. If a respondent made no KG estimations then estimations from the same landing sites/markets for the same species/bucket/basin sizes were taken. This gave us **KG Traded Per Day Per Species Season1=KG1** and the **KG Traded Per Day Per Species in Season 2= KG2**

2) Next the "annual" average KG trader per day was calculated with the average KG traded per day in season 1 and average KG traded per day in season 2. This average was divided by partner numbers where relevant to get an **Annual Average KG Traded Per Day Per Species Per Person**

$$((KG1 + KG2)/2))/\#Partners = KGDSP$$

3) Traders were asked to estimate the purchase prices per species across the two seasons (PP1 & PP2), they responded in a variety of units i.e. per bucket, per KG so the purchase prices were converted to per KG and the seasonal variations were taken into account by getting an average. This step provided an **Annual Average Purchase Price Per Species Per KG Per Person in TSH or PHP**

$$((PP1 + PP2)/2)/ KGDSP = APP$$

4) The same thing was then done with the sales prices (SP1 & SP2 for each season) the traders reported for each season to get an **Annual Average Sales Price Per Species Per KG Per Person in TSH or PHP**

$$((SP1 + SP2)/2)/ KGDSP = ASP$$

5) Now a Gross income value (**Gross Income Per Day Per Species Per Person in TSH or PHP**) could be calculated by using the sales and purchase prices in combination with the KG traded.

$$(ASP - APP)* KGDSP = GIDSP$$

6) As with the fishers the local currencies (Philippines pesos and Tanzanian shillings) were then converted to international US Dollars with the appropriate purchasing power parity PPP conversion factors (Factfish 2016). Giving a **Gross Income Per Day Per Species Per Person in international USD**

$$(GIDSP /PPP)= GIDSP\$$$

7) Trading effort according to time was then taken into account to make sure this gross income was accurate for the days the traders were actually working, so as not to over-estimate the final incomes. This was done by getting the active days per year (DY) for individual traders with the effort data they gave us- See survey Question 2a,b Section 2 Zanzibar & Question 2,3 Section 3 Philippines. An assumption had to be made here for the months traders were active per year (M); this data we failed to collect in the survey thus an informed estimate had to be made according to fieldwork and data from the SPACES project.

Average # Weeks Per Month= W

Active Months Per Year=M

Active Days Per Week= D

$$M*D*W= DY$$

** This calculation was not included in the first set of calculations pre-may 2017

8) Gross income was converted to a yearly value as a means to get the data back down to active days, to get a **Gross Income Per Year Per Species Per Person in international USD**

$$M*D*W* GIDSP\$ =GIY\$$$

** This calculation was not included in the first set of calculations pre-may 2017

9) The yearly values from step 8 were then divided by the number of days traders were active throughout the year according to the effort data to give a final gross income still per species- **Gross Income Per Active Day Per Species Per Person in international USD.**

$$GIY\$/DY = GIDS\$\$$$

** This calculation was not included in the first set of calculations pre-may 2017

10) The **Gross Income Per Active Day Per Species Per Person (International USD)-GIDS\\$\\$** were summed for each individual trader to account for the different species they were trading.

The final unit being the **Gross Income Per Active Day Per Person (International USD)**

$$=> GI\$\$$$

OBS As traders also deal with multiple species on the same day, varying across seasons and years, the same potential for overestimation is present here as with the fishers, see OBS in the fishers calculations above.

B) **RUNNING COST** Calculations

Data extracted from Trader Survey- Question 5a Section 2 Zanzibar & Question 4 Section 3 Philippines, Question 2a,b Section 2 Zanzibar & Question 5 Section 3 Philippines

Traders' costs were given in many different time units (days, weeks, biweekly, 6 months, years etc.) thus the first thing was to standardize costs to the days that traders were active. Running costs were taken as those costs that traders incurred yearly or in any time span less than a year i.e. daily, weekly, monthly. Thus were separated from the bigger investment costs that traders might make on a more-longer term basis.

1) The costs for the different time units the traders used were converted into single unit costs as follows

Each cost (C) was identified individually as either a simple per unit cost i.e. per day, per week or per month; or if the costs were more or less than a simple unit e.g. per 3 weeks, twice a day. For example 50 TSH on salt 3 times per day, the unit was identified as day, the time unit as 3. The cost per day (TU) was thus multiplied by 3 (PU). If not a simple per unit cost then the costs were converted to get a **Cost Per Unit in TSH/PHP**

$$C * TU * PU = CPU$$

2) Costs were then checked to see if they were paid by the trader or by a partner or business owner, which was captured in the interviews. CPU was then divided by the appropriate value; if the trader didn't pay it was divided by 0.

$$=CPUP$$

3) The days traders were active and thus incurring costs were then brought into the calculations. The individual costs were converted into yearly costs.

Average # Weeks Per Month = W

Active Months Per Year = M

Active Days Per Week = D

If the costs was per

Year=CPUP*1
Month=CPUP*M *PU
Week=CPU*M*W *PU
Day=CPU*M*D*W* PU

This step provided the **Cost Per Unit Per Person Per Year** in TSH or PHP= CPUPY

** This calculation was not included in the first set of calculations pre-may 2017

4) The yearly costs from step 3 were then taken down to daily costs for days the traders were actually active i.e. to get the **Cost Per Unit Per Person Per Active Day** in TSH/PHP; the Active Days Per Year (DY) were taken from the gross income calculations.

$(CPUPY)/DY = CPUD$

** This calculation was not included in the first set of calculations pre-may 2017

5) Costs were converted to international dollar using the conversion factor PPP (see gross income costs) to get a Cost Per Unit Per Person Per Active Day international USD

$(CPUD)/PPP = CPU\$$

6) We then summed all the costs for each trader to have a final running cost total per individual Per Active Day in international USD

=> C\$

C) NET INCOME calculations

The gross income values were used and the running costs taken away to give a **Net Income Per Person Per Active Day** in international USD

$GI\$ - C\$ = NI\$$