

# Cornhusker Economics

## Understanding the Economic Characteristics of a Developing Country Marine Fishery— A Case Study of the Digha-Shankarpur Fishery in Eastern India

Market Report	Year Ago	4 Wks Ago	9-16-16
<b>Livestock and Products, Weekly Average</b>			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight. . . . .	131.50	118.00	110.00
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb. . . . .	235.25	165.75	152.86
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb. . . . .	202.24	158.39	141.68
Choice Boxed Beef, 600-750 lb. Carcass. . . . .	231.77	200.54	186.48
Western Corn Belt Base Hog Price Carcass, Negotiated . . . . .	68.15	63.75	54.03
Pork Carcass Cutout, 185 lb. Carcass 51-52% Lean. . . . .	82.91	75.19	80.04
Slaughter Lambs, woolled and shorn, 135-165 lb. National. . . . .	156.14	163.35	160.13
National Carcass Lamb Cutout FOB. . . . .	357.26	351.94	355.69
<b>Crops, Daily Spot Prices</b>			
Wheat, No. 1, H.W. Imperial, bu. . . . .	4.02	2.99	2.74
Corn, No. 2, Yellow Nebraska City, bu. . . . .	3.47	2.99	2.89
Soybeans, No. 1, Yellow Nebraska City, bu. . . . .	8.17	9.42	9.11
Grain Sorghum, No.2, Yellow Dorchester, cwt. . . . .	5.79	4.50	4.50
Oats, No. 2, Heavy Minneapolis, Mn, bu. . . . .	2.65	2.30	2.26
<b>Feed</b>			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton. . . . .	160.00	163.75	145.00
Alfalfa, Large Rounds, Good Platte Valley, ton. . . . .	82.50	72.50	65.00
Grass Hay, Large Rounds, Good Nebraska, ton. . . . .	82.50	*	70.00
Dried Distillers Grains, 10% Moisture Nebraska Average. . . . .	134.50	122.50	120.50
Wet Distillers Grains, 65-70% Moisture Nebraska Average. . . . .	47.50	*	34.25
* No Market			

Fish serves as a primary protein source for large sections of the global population and as a main source of income for coastal populations, particularly those based in developing nations. In this study, we present results of a survey conducted with fishers belonging to the Digha-Shankarpur marine fishery in the eastern Indian state of West Bengal (Figure 1).



Figure 1: Map of West Bengal, India with Location of Digha Circled

The principle motivation of this research stems from the fact that resource management in developing nations is challenged by the presence of extreme poverty in the fishing community. Also, local governments often lack the necessary financial resources and personnel needed for periodic assessment of the biological and economic health of the fishery, *i.e.*, both the ecosystem and the community that depends on it. Additionally, managing marine fisheries is challenging because as common pool resources, these

natural resources are subject to the tragedy of the commons. Thus, long term sustenance of this fishery and livelihoods of people dependent on it requires an understanding of the structure of the fishery, and the economic and behavioral motivations driving fishing behavior in an area grappling with abject poverty. To the best of our knowledge, this is the first study of fishing and economic behavior in the region using primary data (surveys and interviews) collected from 291 fishers from 15 fishing hamlets.

### The Digha- Shankarpur Fishery:

The Digha-Shankarpur region is located in the eastern Indian state of West Bengal, 115 miles south of Kolkata (previously named Calcutta), the state capital. The fishery is one of the major fisheries of the state and supplies fish to both Indian and foreign markets. According to the 2011 Census, out of the 46,532 individuals living in the area, more than 20,000 individuals earn their livelihood from this fishery (Mandal et al., 2013). Yet, despite the importance of this industry to the local economy, the fishers are among the poorest in the country with a long history of neglect by state governments. Additionally, the fishery is vulnerable to natural and anthropogenic stressors such as (i) cyclones (ii) overfishing (iii) water pollution and (iv) competition from neighboring domestic (in the state of Odisha) and international fisheries (in Bangladesh).

Fishing goes on for 10 months each year. For the remaining 2 months – typically from mid-April to the end of June, the fishery is closed in an effort to let the fish stocks regenerate. There are three types of fishers in this industry depending upon their access to technology which permits them to operate within specific distances from the shoreline. Row-boat fishers are informally organized and operate within 5 to 7 nautical miles (nm) from the shore with manually operated boats. Motor-boat fishers operate further out at a distance of 5 nm from the shore up to the limits of the territorial sea (12 nm). Beyond this distance and within 200 nm of India’s exclusive economic zone, trawler boats operate. There are both structural and behavioral differences between these three types of fishers that contribute to the nature of economic interactions between them and the overall prosperity and sustainability of the fishery. This article focuses on the first two types of fishers which make up the subsistence fishing sector.

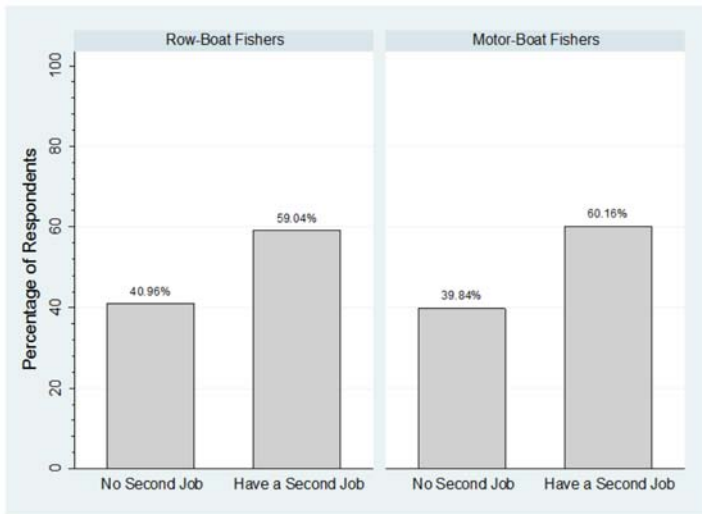
### Description of Different Types of Fishers:

Table 1 presents a summary of survey responses from all row-boat and motor-boat fishers. Fifty seven percent of all fishers interviewed are row-boat fishers who either own a boat or are a crew member in another fisher’s boat. This group has the lowest per capita earnings in the fishery on the basis of trips made on a daily basis. However, weather hazards and physical exertion (from operating the manual boats) frequently lead to loss of fishing days. As a result,

**Table 1. Descriptive Statistics**

Variables	Description	% of Respondents
Age of the fisher (years)	10 - 29	12
	30 - 49	61
	50 - 69	26
	≥70	1
Years Schooling	<5	33
	5 - 8	52
	9 - 12	16
Marital Status	Married	97
	Single	3
No. of family members	<5	58
	5 - 10	41
	>10	1
No. of earners in the family	1	72
	2	21
	3	4
	4	1
	5	1
Boat Type	Row-boat	57
	Motor boat	43
Boat Ownership	Owner	29
	Not an owner	51
	Joint owner	20
Having a second job	Yes	94
	No	6
Daily Earnings (in Indian Rupee)	≤100	27
	100 - 500	66
	500 - 1000	5
	≥1000	2

many of these individuals have to take recourse by getting a second job as presented in Figure 2. This job usually involves participating in Digha’s local tourism industry or working on a contractual basis on trawlers. They are further economically disadvantaged by the fact that trawlers use sophisticated fishing technologies such as nets with fine mesh and sonar to fish from the sea bed which leaves very little stock near the shore for these individuals. Moreover, lack of access to capital prevents these individuals from purchasing boats and nets that would permit them to go further out into the sea and make longer trips (3-4 days). These boats typically catch species that are low priced and sold in the local markets. Hence, their harvest is a primary protein source for the local towns.



**Figure 2: Types of Fisherman by Their Second Job**

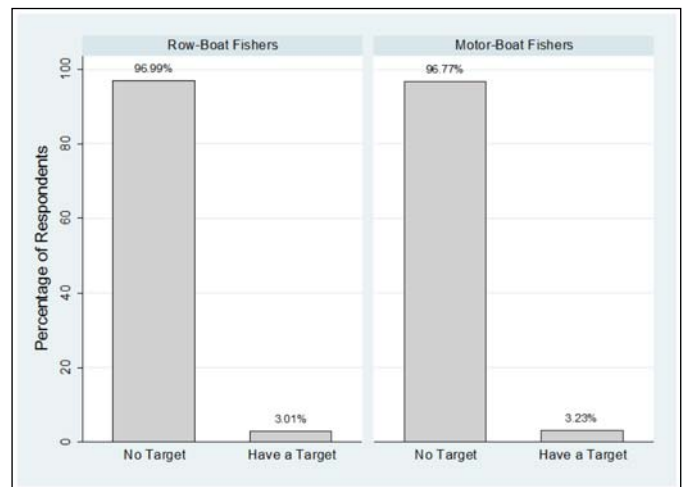
Motor boat operators composed 43% of the survey respondents. For both types of fishers individual or collective boat ownership exists (Table 1). Single boat owners enter into an annual contract with crew members every year and pay them a percentage of revenue earned after accounting for the costs of operation (gear, oil, ice to keep fish fresh etc.). In the case of co-ownership, revenue earned is equally shared by all members. This is true despite the presence of an appointed leader—a more experienced fisher, who is in charge of bookkeeping, purchasing decisions and determining the duration of fishing trips. Even if a fisher loses some fishing days owing to illness or family obligations, they receive an equal share of the revenue. In fact when asked “*What if someone misses a fishing day, say, due to illness or family issues that need attention?*” The respondent said “*He will still get his share of revenue earning because he is one of the owners of the boat.*” The success of this joint ownership venture is further reliant on trust between the owners. Thus when further asked, “*What if someone takes too many days or calls in sick frequently?*” A respondent answered, “*This typically doesn’t happen because there is a certain level of trust and understanding among the crew because he can face the same situation another day.*”

#### Description of Effort Choices:

One of the key goals of this study is to understand the determinants of fishers’ daily effort choice. Camerer et al. (1997) found negative labor supply elasticities for taxi drivers in New York City, suggesting target-earning behavior whereby when the daily earnings target is reached, taxi drivers will end their work shift, irrespective of the number of hours worked. However, Farber (2005) found contradictory evidence where their decision to terminate work on any day depends on cumulative hours worked, and not on cumulative earnings. These conflicting observations and the fact that open-sea fishing like driving a taxi is an activity that poses risks to the individual (in terms of life and health) and

does not always generate a very high revenue underscores our interest in studying the issue for the Digha-Shankarpur fishery an understudied research area. In doing this, our study adds to the literature as well as compliments work being conducted by Gine et al. (2009) who study effort choice in a fishery in Southern India.

Figure 3 indicates that most of the fishers don’t operate with fishing targets which given the risky nature of the activity is unusual. One possible explanation could be that given the high variability in day-to-day earnings because of uncertain weather patterns and ocean dynamics, subsistence fishers may not think in terms of earning targets. Moreover even if they would like to think in terms of targets, unwillingness to join the trawler boats and lack of alternative safer job opportunities makes it harder for them to consider harvest and earning targets.

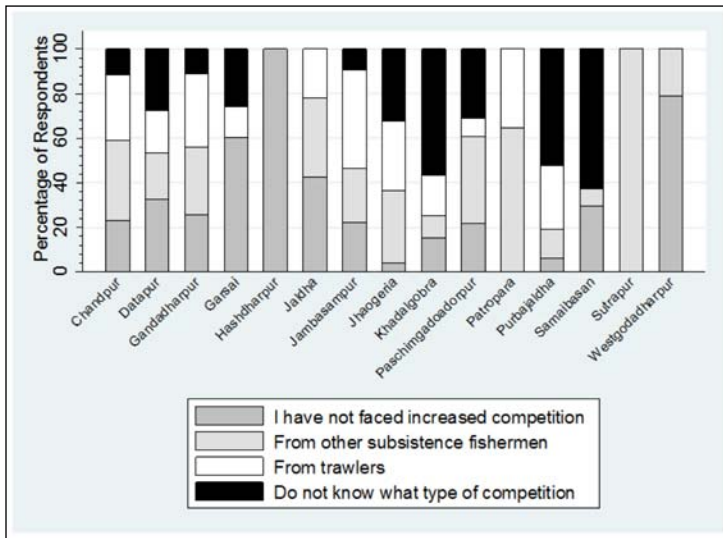


**Figure 3: Presence or Absence of Targets by Boat Type**

#### Nature of Competition and Fishing Risks:

Figure 4 presents the percentage split of the responses to the question about the type of competition faced in different survey locations. We observe that barring a few locations, most fishers face competition from their peers or from the deep sea trawlers. However, there is some variation in the responses from different locations largely explained by which type of fisher (subsistence or trawler) predominates in those locations.

Competition, especially from the trawler boats, has not benefited the subsistence fishers because of the limited regulation associated with open sea fishing and over-fishing. In fact, despite most respondents being aware of water pollution, weather risk and climate change, all respondents identified competition from trawlers (and



**Figure 4: Competition by Different Regions**

the rapid increase in their number) as the single most important threat to both resource stock and their livelihoods. This is because as mentioned, trawlers use large fishing nets with fine mesh to scrape the bottom of the seabed and collect all species of fish. The fish which are not valuable to trawlers are then discarded as bycatch. However, these bycatch species are those which are targeted by the subsistence fishing sector suggesting a problem for profitability and survival as well as an increase in the price of fish in local markets.

#### **The Role of the Government:**

The interviews and surveys yielded a key insight about the subsistence fishers themselves. These individuals have a high level of risk aversion that contributes to their unwillingness to find jobs on trawlers even if that would guarantee them a steady monthly income. For example, a respondent who hadn't had any earning over the past 22 days (owing to a temporary jelly fish infestation that destroys nets) and whose family was surviving on informal borrowing from friends and relatives said that he wouldn't work on a trawler for any duration even if given an opportunity to do so. Since fishing is a key part of their livelihood and culture, and because these subsistence fishers serve the local market, it is essential that institutions and mechanisms be identified that can alleviate some if not all the inefficiencies facing the fisher.

Here, the government can play an important role by ensuring better utilization of the services offered by the local office of the West Bengal Marine Department in Contai, a town few miles north east of Digha. These services include licensing boats in order to prevent overcrowding and increased pressure on the fishing resource, implementing gear restrictions, gathering harvest estimates etc. These measures would reduce the competition between subsist-

ence fishers which as Figure 3 indicates is a key stressor. Additionally, the local government can work to ensure that subsistence fishers have access to credit and systematic loan repayment plans which would allow them to make decisions regarding purchase and maintenance of boats, fishing nets, wireless trackers etc. Finally, the local government can also ensure that these fishers have access to jobs outside of fishing which would make them eligible to receive compensation under the Mahatma Gandhi National Rural Employment Guarantee Act (2005) that guarantees 100 days of paid work in the financial year for a household with adults involved in manual labor.

The government does keep track of the trawler sector since it is the primary sector responsible for export earnings. However, active monitoring of harvest and bycatch regulating policies are absent (which is a loss for the row-boat and motor-boat sectors and the ecosystem as a whole). Thus, economic viability of the subsistence fishery and overall resource sustainability can be improved through regulations imposing restrictions on the type of technology used to catch fish (that would reduce bycatch), the time or season during which fishing is allowed and the size of the fish caught.

#### **Conclusion:**

The results of our survey suggest that the administration process of managing fishers and the fishery resources have to be organized in a way that it focuses on different types of fishers and the constraints they face in fishing in different parts of the fishery. The government needs to play an important role in making subsistence fishing viable. Moreover, there is a need to raise awareness about climate change and damage to the ecosystem due to overfishing. Here, information dissemination can play a key role. In summary, more case by case studies are needed to identify best policies to manage fishery resources and the livelihoods that depend on it.

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