



# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



## ADAPTING A LEAN PRODUCTION SYSTEMS APPROACH TO AQUACULTURE IN NIGERIA

Save time, money, and grow your profits with Lean aquaculture!



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## PRESENTATION FLOW

- Lean Introduction
- Project Genesis and Theory
- Structure and Strategy
- Intervention Outputs and Impacts
- Looking Forward



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## WHAT IS LEAN?

- **Lean: Operations & Management**
  - Maximize productivity while simultaneously minimizing waste
  - Tools, techniques, and systematic steps
  - Culture of continuous improvement and problem solving





## PROJECT GENESIS & THEORY

- Dr. Joe Steensma & Dr. Oyebola
  - Walking through aquaculture facilities
  - Seeing waste
  - Theory: Lean can help the Nigerian aquaculture sector become more efficient





## LEAN & AQUACULTURE

- Improve farmers' output, nutrition, income, and livelihood
  - Improve operational efficiency
  - Reduce post harvest losses
  - Improve waste management
  - Decrease the cost of production
- Identify waste, carry out improvement activities on the waste, and estimate the improvement





## STRUCTURE AND STRATEGY

- 2019 team formed, grant received 2020
- Targeted the states of Ogun and Delta
- Utilized cluster and corporate fish farmers





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## STRUCTURE & STRATEGY

- 40 participants; 20 from each location
  - Head cluster fish farmers
  - Fish and feed processors
  - Cooperatives



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## STRUCTURE AND STRATEGY

- Participants would become Lean Subject Matter Experts or LSMEs
  - Train other fish farmers
  - Carryout LEAN based mini-projects and improvement activities on self and other farm plots
  - Collect data on improvement activities
  - Upload improvement data onto software-Redcap
  - Monitor, technically support data collection and upload





## PROJECT CHALLENGES

- Selected Delta region
  - USAID target area, personal safety concerns
- Covid
  - International travel halted
- Solution: flexibility and creativity





## PROGRAM

- Sensitized participants early on
  - Lean strategy and wastes
  - Need for improved efficiency and benefits
- Training – June 2021 (1-week)
  - Virtual, hybrid, physical, and field activities
  - Accessible, engaging activities/competitions
- In-field projects – June 2021 (1-week)





## FIELD ACTIVITIES - EXAMPLES

- Farms
  - Water quality, feeding, production, underutilized personnel
- Processing
  - Organization, layout, operations
- Feed mill
  - Quality of feed production process
  - Storing feed ingredients





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## PROJECT OUTPUTS

- Produced 40 Lean Subject Matter Experts (LSMEs)



- Physically sensitized on LEAN and data collection software (Redcap) at Ogun and Delta
- LSMEs trained on LEAN tools and methods in the classroom and during fieldwork



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## PROJECT OUTPUTS CONTINUED

- LSMEs improved their efficiency and colleagues'
  - Trained over 400 colleagues (242 Delta; 181 Ogun)
  - Undertook improvement activities on 175 farms (Sept 2021- April 2022)
  - Uploaded 212 mini-projects containing 425 Lean improvement activities on farms





## DATA FRAMEWORK

- Africa's aquaculture is characterized by smallholders and corporate farmers
- About 80 percent farming population in Nigeria are smallholders (Awoke & Okorji, 2004)
- Aquaculture seems to produce at a less efficient level in Africa
- Technically, efficiency means the ratio of useful work performed by a machine or in a process to the total energy/effort expended
- Production efficiency compares production with cost (as in energy, time, and money)





## DATA FRAMEWORK

- Lean identifies wastes along the aquaculture value chain
- Improvement activities are carried out on the identified wastes, and improvement results are estimated
- Lean presents increased efficiency as improved production per unit effort or percentage reduction in waste of time, inputs, labour, cost of production, and reduced cost of effort expended per unit operation

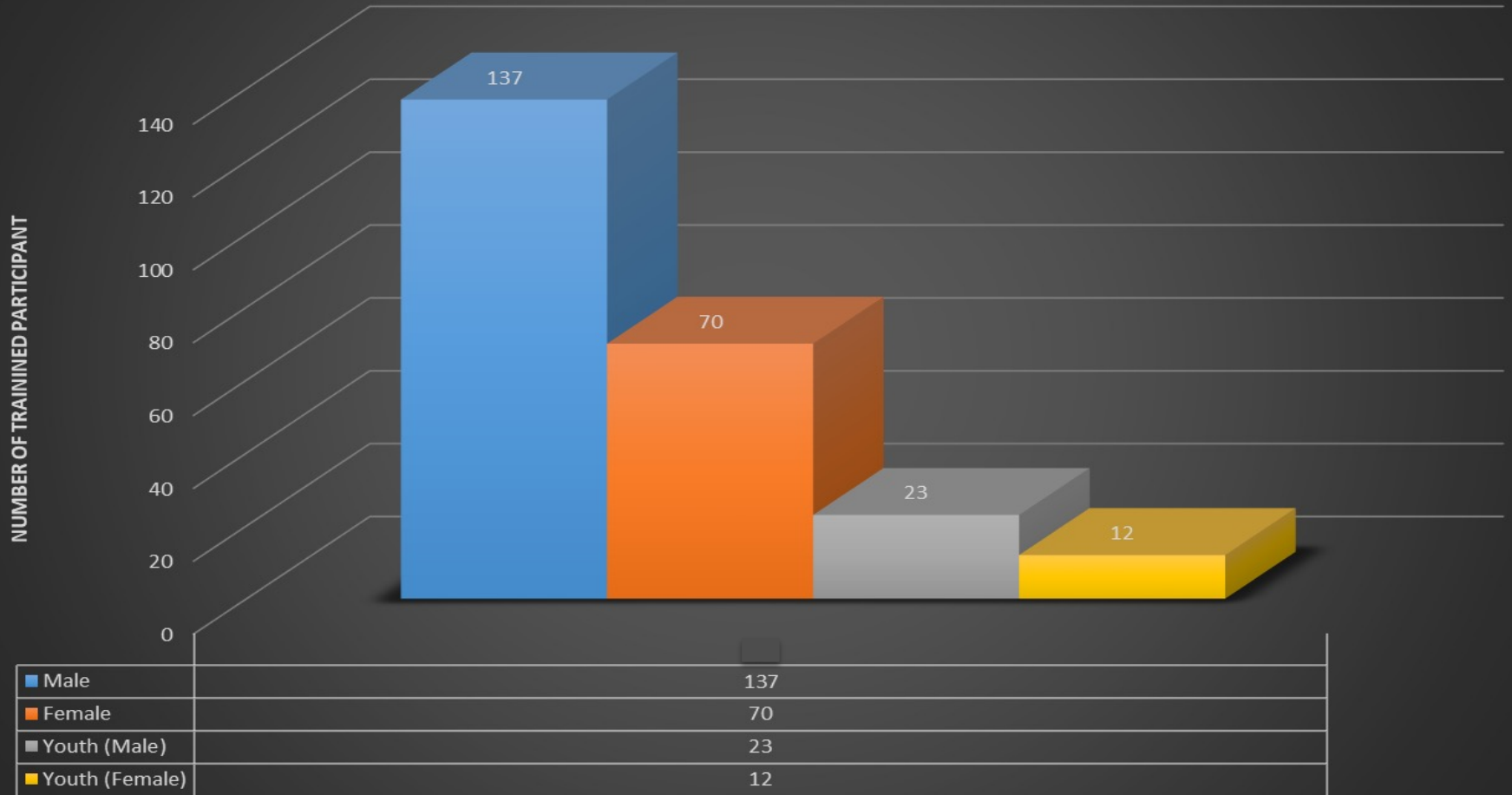




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## Delta State LSMEs Training



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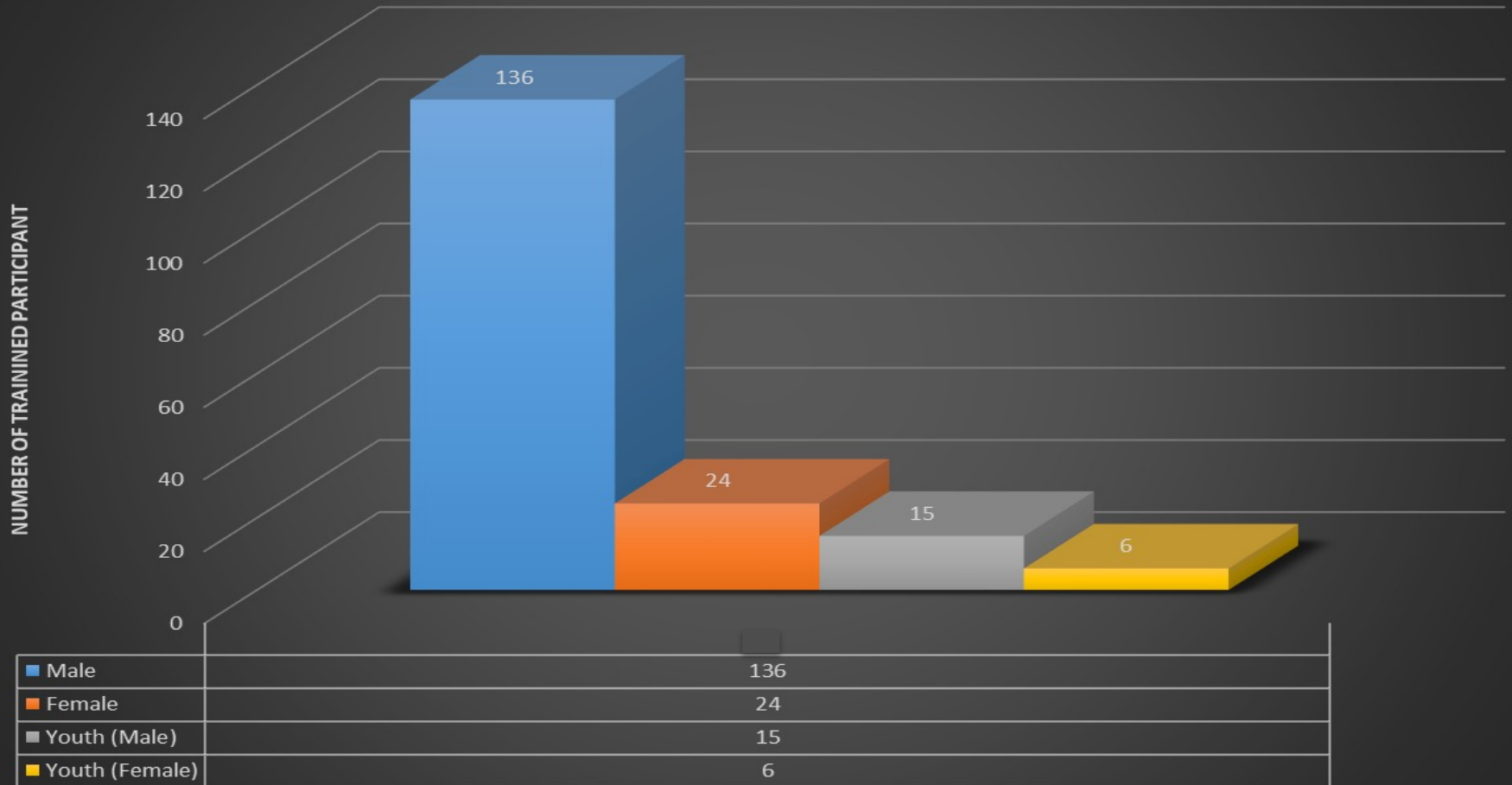
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## Ogun State LSMEs Training



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S/N	Project Activities	Number of cases
1	Reduction of mortality	41
2	Workplace organization	27
3	Reduction in excessive motion	58
4	Non utilizing people/over utilizing people	7
5	Reduced fuel/energy used in production	47
6	Inventory	27
7	improve space use efficiency	32
8	Reduction in flood loss	6
9	Defect and rework	16
10	Time waste in extra-processing	20
11	Reduction in medicine/antibiotics used	13
12	Reduction in rate of water treatment	10
13	Control of aquatic macrophytes (weeds)	1
14	waste in over production	11
15	Reduced labour	33
16	improved quality	15
17	Cost and time of feeding	30
18	Diseases occurrence	7
19	Reduced time to market	9
20	Water treatment	9
21	Quality of staff effectiveness	1
22	Improved record keeping	5
<b>Total</b>		<b>425</b>



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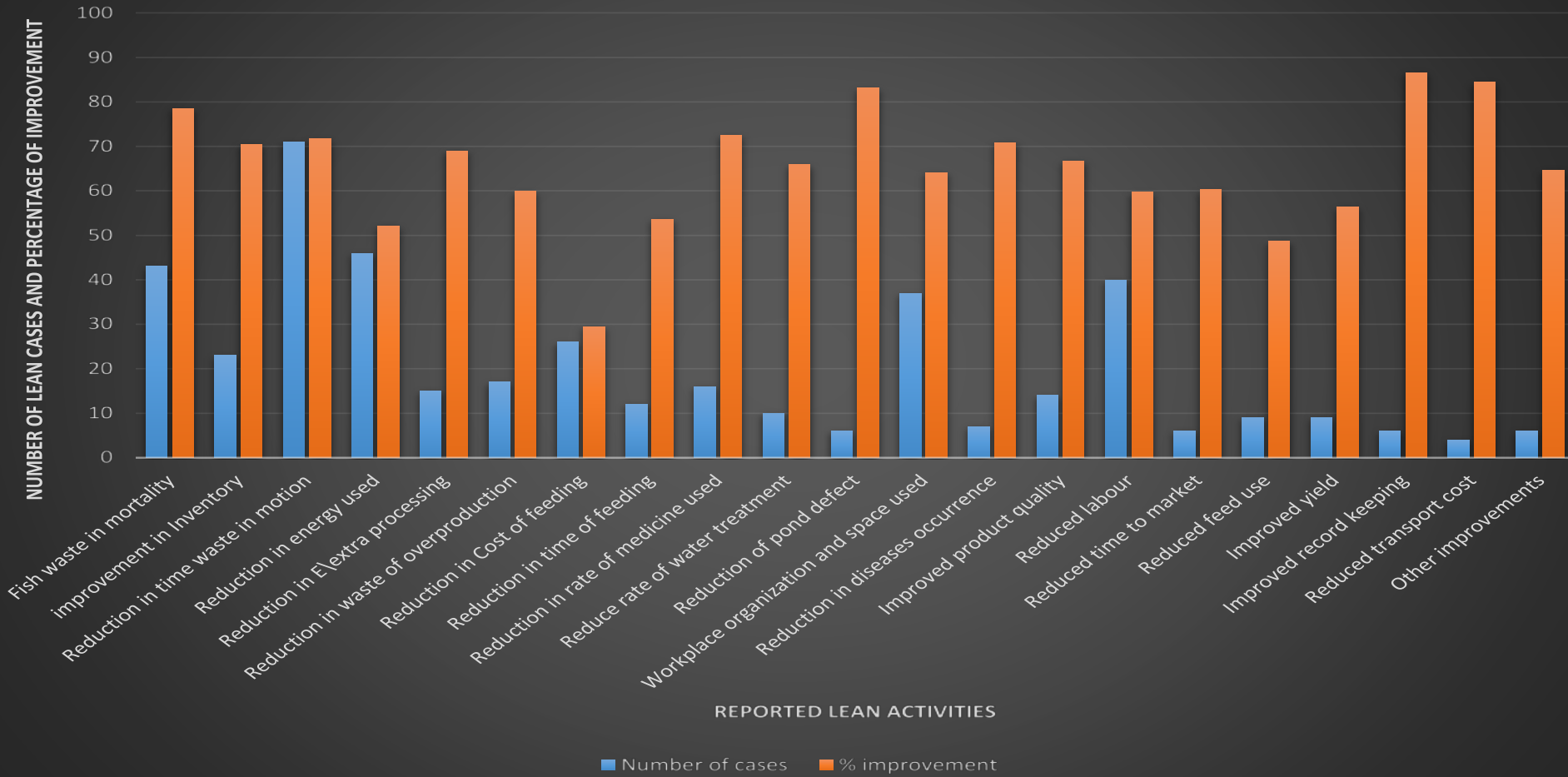
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## LEAN WASTE IMPROVEMENT CHART



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## RANGE OF IMPROVEMENT ON FARMS THROUGH LEAN

	Minimum (%)	Maximum (%)	Mean	Std. Deviation
Fish waste in mortality	4.20	100.00	78.44	25.63
improvement in Inventory	7.92	100.00	70.49	29.42
Reduction in time waste in motion	3.00	100.00	<b>71.64</b>	21.95
Reduction in energy used	6.00	100.00	52.13	23.33
Reduction in extra processing	25.00	100.00	<b>68.93</b>	22.15
Reduction in waste of overproduction	3.50	100.00	<b>59.87</b>	29.97
Reduction in Cost of feeding	.70	82.00	29.45	20.81
Reduction in time of feeding	11.11	83.30	53.65	22.69
Reduction in rate of medicine used	33.30	100.00	72.52	19.28
Reduce rate of water treatment	.60	99.00	65.89	26.80
Reduction of pond defect	27.21	100.00	83.07	29.69
Workplace organization and space used	25.00	97.10	64.05	17.82
Reduction in diseases occurrence	45.00	100.00	70.85	22.17
Improved product quality	35.18	100.00	66.79	21.38
Reduced labour	20.00	100.00	59.70	21.38
Reduced time to market	33.30	96.00	60.26	24.85
Reduced feed use	16.67	100.00	48.65	30.45
Improved yield	20.00	100.00	56.33	35.19
Improved record keeping	50.00	100.00	86.57	20.36
Reduced transport cost	37.50	100.00	<b>84.38</b>	31.25
Other improvements	27.21	100.00	64.63	32.59



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## RESPONSE FROM BENEFICIARIES

*“This training is taking me from the level of unknown to the known on how to manage wastes and increase production. It will enable elimination of poverty for people in aquaculture. The training came at the right time to reduce wastes and maximize profit.”*  
-Gospel Nwodo (Delta State)

*“The acquired LEAN knowledge would save up to 30% operational cost. The training gave the needed knowledge and knowledge surpass money, if you don't have knowledge, you cannot get profit”. - 26 year old David Agwadu, Delta State*

*“This training is good. We have been making mistakes. A lot of negative things happening on our farms can be reduced through the learnt lessons from the training.”*  
- Kolawole Kudirat, Delta State

*“Application of the Lean training skills improved workplace organization on my farm, minimized waste associated with feeding fish by 50%, and reduced the cost of pumping water by 70% by abolishing all-day water pumping” - Sunday Isomo, Ogun State*



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## LOOKING FORWARD

- Nigerian aquaculture is growing
- Our Lean program can help
  - Easily learned and quickly adopted
  - Immediate, measurable results
  - Program structured for leverage; train the trainer
- This study is a pilot with two states out of 36
  - Potential to improve aquaculture efficiency in other states and countries practicing aquaculture
- We are thankful for this opportunity





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