



Manipulation in Stocking Density of Carps to Increase Yield in Flood and Drought Prone Areas in Nepal



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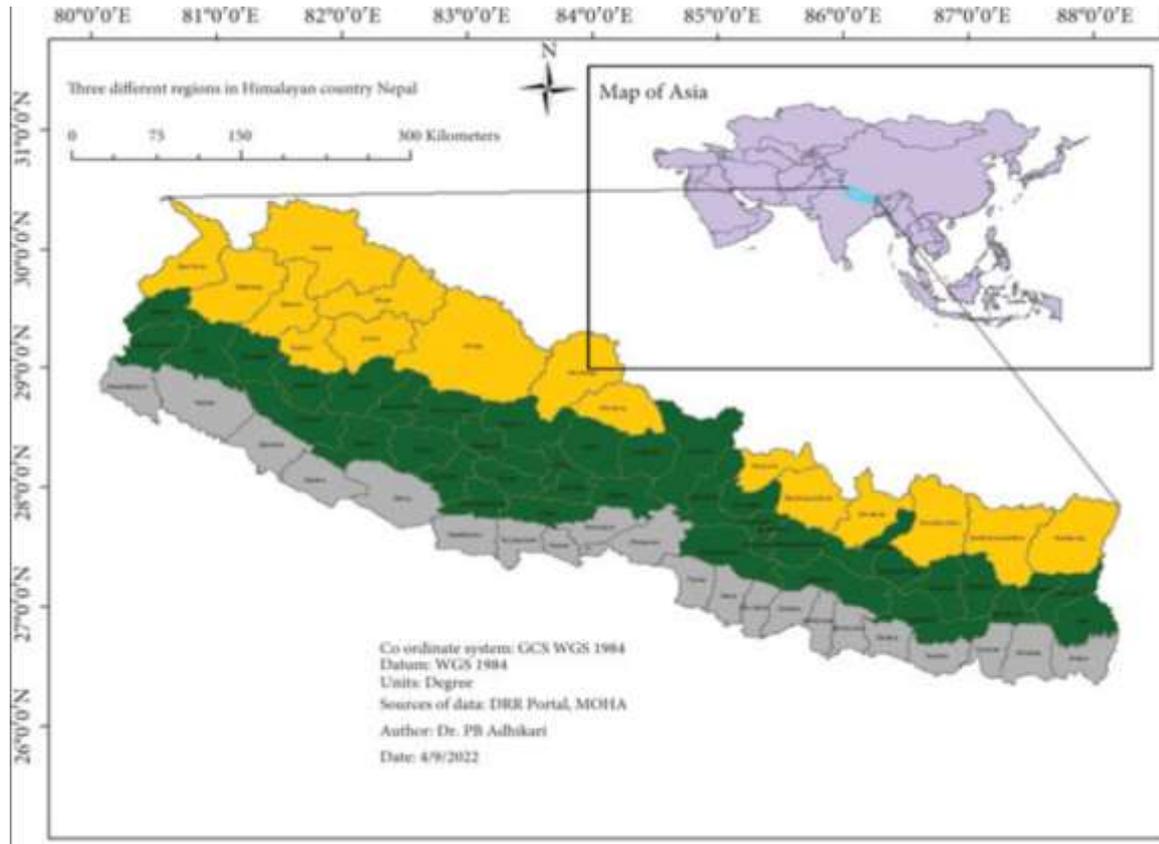
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Background

- Nepal was ranked fourth in terms of vulnerability to climate change and thirtieth in terms of flood risks (UNDP, 2020).
- The Terai region – flood and drought prone area.
- Terai region hosts the majority of Nepal's aquaculture activities.



- In 2017, flooding affected 31 districts in Terai, causing loss of >60% of fish.
- In 2020, over 80% of fish ponds were impacted by flood in Terai.



Modification in Stocking Combination and Density

| Stocking combination | Climate smart carp polyculture | | Conventional carp polyculture | | Difference in density (No./m ²) |
|---------------------------------------|-----------------------------------|----------------|-----------------------------------|----------------|---|
| | Density (No./100 m ²) | Percentage (%) | Density (No./100 m ²) | Percentage (%) | |
| Surface feeder (Silver, Bighead carp) | 20 | 15.4 | 52 | 34.7 | -32 (61%) |
| Column feeder (Rohu, Grass carp) | 60 | 46.2 | 60 | 40.0 | No change |
| Bottom feeder (Mrigal, Common carp) | 50 | 38.5 | 38 | 25.3 | +12 (32%) |
| Total | 130 | 100.0 | 150 | 100.0 | -20 |

Reasons of Changing Stocking Densities

- Higher possibility of loss of surface lying fish from being swept away during flood than bottom lying fish.
- Higher possibility of mortality of surface lying fish during drought from
 - heated water
 - predation such as bird than bottom lying fish in shallow ponds



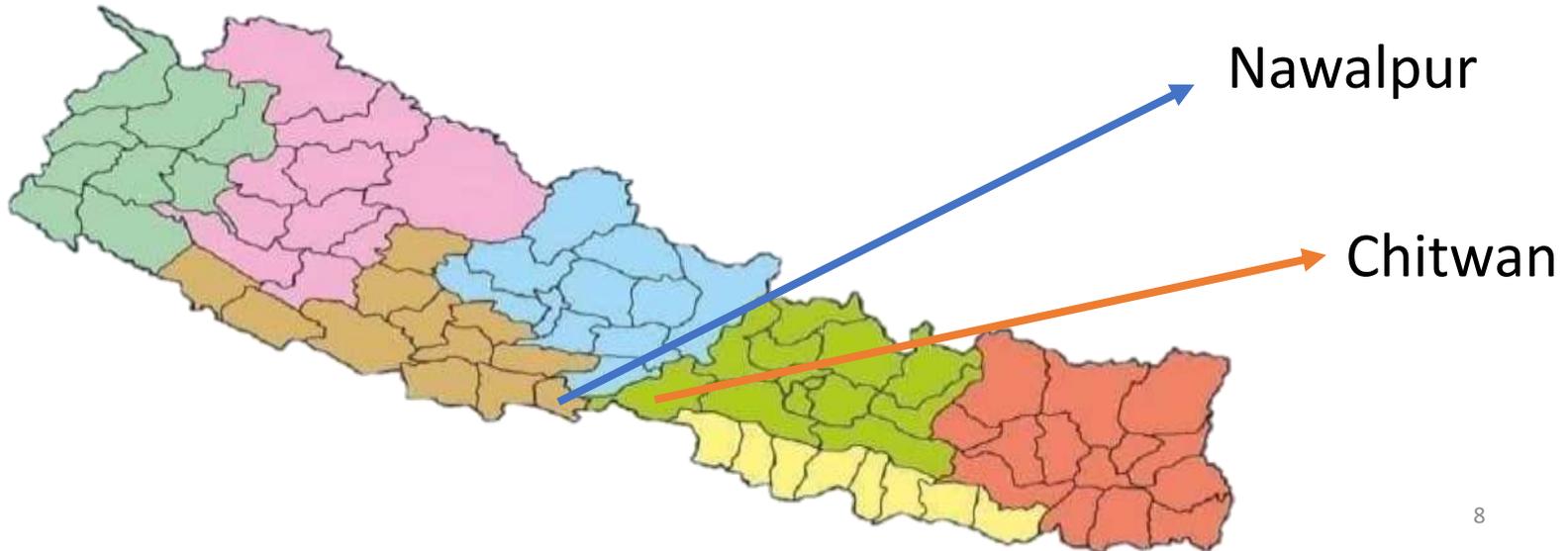
Objectives

- To develop a climate-smart carp polyculture technology.
- To improve productivity of carp.

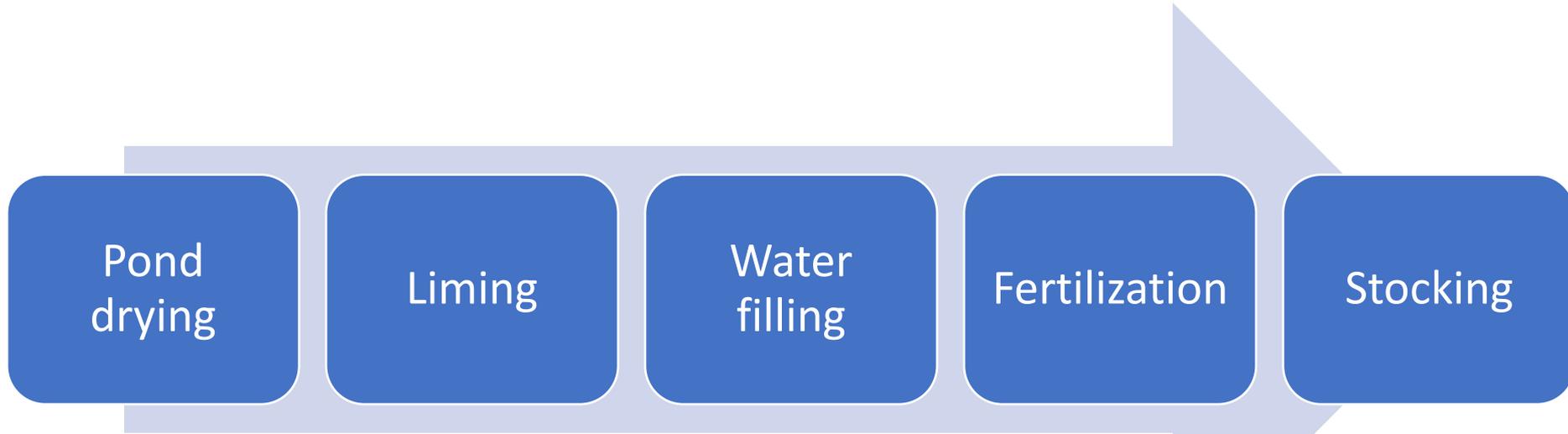


Methodology

- Location: Chitwan and Nawalparasi districts.
- Beneficiaries: 111 farmers (102 women and 9 men) from 3 fish farmers' cooperatives (2 women cooperative and 1 mixed) and 4 women fish farmers' self-help groups. Majority were Tharu ethnic community.



Pond Preparation



- Agricultural lime : 500 kg/ha
- Urea: 470 g/100 m², DAP: 350 g/100 m² (Knud-Hansen, 1998)
- Culture period: 8 months, March-November 2022

| Carp | Climate smart carp polyculture | | Conventional carp polyculture | |
|-------------|-----------------------------------|----------------|-----------------------------------|----------------|
| | Density (No./100 m ²) | Percentage (%) | Density (No./100 m ²) | Percentage (%) |
| Silver carp | 15 | 11.5 | 30 | 20.0 |
| Bighead | 5 | 3.8 | 22 | 14.7 |
| Rohu | 30 | 23.1 | 30 | 20.0 |
| Mrigal | 20 | 15.4 | 15 | 10.0 |
| Common carp | 30 | 23.1 | 23 | 15.3 |
| Grass carp | 30 | 23.1 | 30 | 20.0 |
| Total | 130 | 100.0 | 150 | 100.0 |

Feed and Feeding

- Supplementary feed: Rice bran and mustard oil cake (1:1).
- Feeding rate: 3% BW
- Feeding frequency: Once a day in the morning
- Grass carp: Banana leaves, grass and legumes at 50% BW
- Feeding tray was used.
- Ration adjusted monthly based on fish sampling.



- **Partial harvesting**
- Some farmers consumed and sold fish during Dashain festival.
- Farmers recorded number and weight of carp, consumed and sold during festival. They also recorded dead fish in the record book.
- **Final harvesting**
- Harvesting in November 2022.
- Farmers drained ponds and did netting to collect fish.
- On harvesting fish were weighed in batches and final weights of fish was determined. Carp production was calculated summing up batch weights of fish.

Carp production was evaluated and compared with that from conventional polyculture practices adopted by the same farmers, in the previous year.

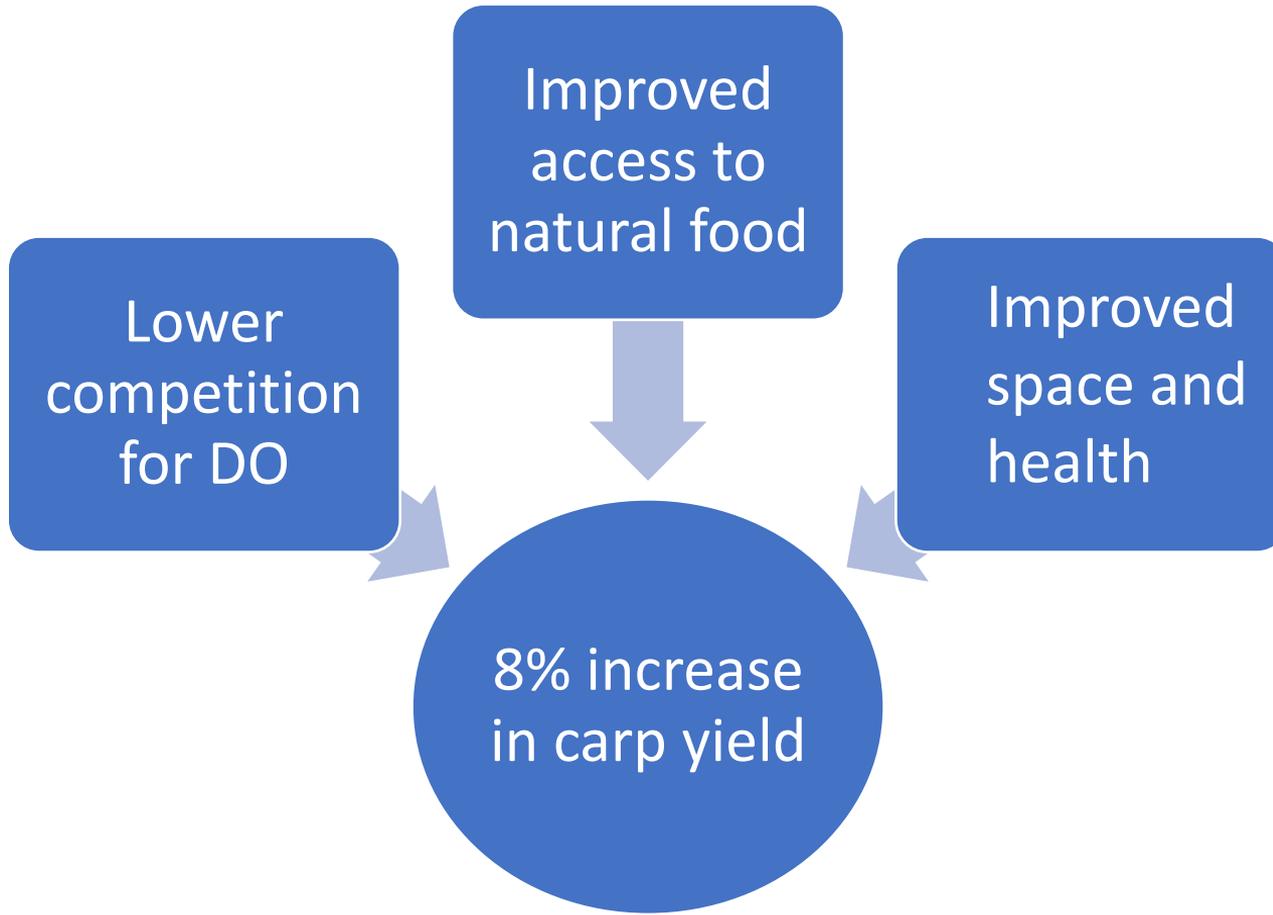
Results and Discussions

Production of Carp in Climate Smart Carp Polyculture in 8 Months

| Group/Cooperative | Pond area (m ²) | Total fingerling stocked (No.) | Total carp production (kg) | Carp production (kg/100 m ²) |
|-------------------|-----------------------------|--------------------------------|----------------------------|--|
| Sundardep cop. | 4150 | 5391 | 1627 | 39.2 |
| Kapia cop. | 12587 | 16473 | 5585 | 44.4 |
| Mishrit cop. | 11447 | 15209 | 5571 | 48.7 |
| Namuna grp. | 3694 | 4815 | 1407 | 38.1 |
| Rai grp. | 5781 | 7527 | 2755 | 47.7 |
| Pragati grp. | 2270 | 2956 | 1269 | 55.9 |
| Nava Jyoti grp. | 5661 | 7375 | 2708 | 47.8 |
| Total | 45,590 | 59,746 | 20,922 | |
| Mean | | | | 46.0 |

Comparison Between Climate Smart and Conventional Carp Polyculture

| Group/Cooperative | Pond area (m ²) | | Yield (kg/100 m ² /yr) | |
|-------------------|-----------------------------|----------------------------|-----------------------------------|----------------------------|
| | Climate smart carp polyclt. | Conventional carp polyclt. | Climate smart carp polyclt. | Conventional carp polyclt. |
| Sundardeep cop. | 4150 | 4030 | 59.6 | 67.1 |
| Kapia cop. | 12587 | 16743 | 67.5 | 36.7 |
| Mishrit cop. | 11447 | 13346 | 74.0 | 67.6 |
| Namuna grp. | 3694 | 3694 | 57.9 | 61.8 |
| Rai grp. | 5781 | 5781 | 72.5 | 77.3 |
| Pragati grp. | 2270 | 2320 | 85.0 | 75.4 |
| Nava Jyoti grp. | 5661 | 6651 | 72.8 | 67.0 |
| Total | 45,590 | 52,565 | | |
| Mean | | | 69.9 | 64.7 |



Reasons

Conclusion

- The modified stocking density and species compositions increased fish yield and presented a viable strategy for carp farmers in flood and drought-prone areas to enhance resilience and productivity in fish farming.

Recommendations

- Further scientific validation is needed.

Acknowledgment

- AquaFish Innovation Lab
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- Farmers

Thank you