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Integrated fish farming with special reference to paddy cum fish culture under climatic stress

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Abstract
Many farmer cum fisherman are suffering from declining income and increasing financial insecurity mainly as a result of climate change. Integrated Fish Management has been an important strategy for ensuring the sustainable use of water resources in recent years. Awareness towards climate change has to targated to address the socio-economic needs of such communities that are highly dependent on fisheries & farming for their survival, are required to be address wider environmental concerns. The intrinsic links between poverty and the environment have been well known and are needed to be discussed and studied Paddy cum Fish Culture is almost as primitive as Paddy Farming. These fishes are taken to initiate additional for extra income. Rice –cum-fish culture is practiced almost in all rice growing belts. The study was done in Madhya Pradesh, Dist. Seoni, Tehsil Keolari, Village-Kanchanwada. The survey was done in two concurrent years of 2015-16 & 2016-17. As a result the seasonal income through fishes and Paddy had been widely affected upto 50% due to very less rainfall and high temperature during monsoon in 2016-17.

Keywords: integrated fish management, sustainable use, intrinsic links, paddy cum fish culture, extra income

Introduction
Achieving the Millennium Development Goals (MDGs) on poverty, hunger and environment simultaneously is a change, as the goal seem to be in direct conflict with each other, particularly when reflecting on the role of water management. This is because a reduction in poverty and hunger requires water for agriculture while environment sustainability requires sufficient water for ecosystems to prosper (S. Atapattu & D. Molden, 2006). There is great need of water for Agricultural withdrawals from rivers, wetlands and ground water. Rice and fish, both are staple food, for Indians. India is an agro-based developing country and obviously the future development of the country is very much related with the agricultural sector. If we focus on the Socio-economic activity, fisheries ranks second position in the world to agriculture sector, fisheries play significant role in terms of nutrition, employment, foreign exchange and most importantly socio-economic stability in the rural areas (Paul and Chakraborty, 2016).

India is the land of water having several rivers and also having natural water resources in agricultural sector. Madhya Pradesh is rich in fresh water resources and fishery as on the major sub-sector plays vital role. As the whole a small survey based study was done in Madhya Pradesh dist-Seoni situated on NH-7 under which Tehsil-keolari, Village-"Kanchanwada" was selected for the study. This Taluka village was intentionally selected as it is reportedly rich in Paddy Culture, well irrigated, black-sandy soil is found here and above all, the fishermen cum farmers have extra income through Paddy cum Fish Culture. The fishes captured in Paddy fields come through the water channels and rainy water resources the fingerlings reach fields (Bassi et al., 2014).

No intentional purchased or bought fingerlings are introduced. These farmers depend on grace of Nature's, rainfall and overflow of water from different surrounding rivers, ponds, canals, which bring water to Paddy fields along with fingerlings which grow here, as a whole Paddy –cum-Fish Culture (Ali et al., 2010).sThis zone cultures a famous Paddy crop species – "JEERA SHANKAR" rice which is worldwide famous for its scent, flavour with small sized rice. It is one of the most expensive variety of that area. This variety needs maximum water supply as compared to other varieties of rice. So, the fields having this species of Paddy gives good yield of fishes also.

The study was done in that area or fields selected were having good water resources, having canals, nearby pond and small rivers, which bring ample amount of fingerlings in fields for Paddy cum fish culture.

Materials & Methods
- Observation and Survey based study was done.
- Questionnaire was filled by the fisherman cum farmers.
- Comparative study of two concurrent years 2015-16 and 2016-17.
- 50 farmers cum fisherman ware considered for survey study.

Questionnaire: 50 Farmers
1. Name of Farmer cum fisherman –
2. Preference to Paddy cum Fish Culture-
3. Whether have technical knowledge about- dry cum fish culture
4. Whether purchased fingerlings are introduced
5. Water resources
6. Paddy species which are preferred-
7. Fish species obtained-
8. Which fish species is mostly on demand-
9. Seasonal income earned from fishes-
10. Paddy income earned per acre-

11. Which year was more profitable & why?
12. Whether Climate change is responsible for - Socio-economic downfall.
13. Only fish production was affected or both Paddy & Fishes-
14. Use of Pesticides and fertilizer harm fishes-
15. Whether fish cum Paddy culture plays significant - role in upgrading the socio-economic status
16. Whether the climate change is responsible for - decline in socio-economic status with respect to Paddy cum fish culture in last 2 concurrent years

Result & Discussion

This zone is rich in irrigation facilities and famous for good variety rice which are produced named- Jeera Shankar, hmt, Shriram, Chintu etc. which give good yield. Along with rice these farmers have extra/additional income from fishes, which grow in these Paddy fields.

These fields fulfill almost all basic parameters of soil and water favourable for Paddy cum Fish Culture in natural way and not much extra manual efforts are needed, only maintenance part is emphasized as a whole. The season for Paddy cum fish culture is monsoon from mid June to Aug. The fields are prepared in Summers, Manuring, Ploughing and repairing of boundaries are done in summers and channel connectivity to water resources are also done and fields get ready in summer for monsoon. As the Monsoon starts from mid June, the sowing activity gets started, Water is stored in fields upto a particular level for sowing Paddy saplings. The water which enters through water resource channels bring fingerlings in month of July to August to fields. There is mixed variety of fish species fingerlings reaches to the Paddy fields- mainly- Rohu Catla, mrigal, Padhin, Clarias batrachus, Sawal, Channa etc.

In 2015-16: There was very good rainfall as a result good fish breeding required parameters peristed, good yield of fingerlings which reached to fields, the density was high in Paddy fields.

- The fishes had good growth in Paddy fields and the farmers had very good yield of fishes as well as very good Paddy crop production in month of Oct-Nov.
- On an average the farmers cum fisherman has nearly 6000-7000/- seasonal income from fishes.

In 2016-17: There was noticeable great climate change observed in the same zone. The temperature in summers was also very high as compared to previous year, as well as the rainfall was also very poor, below average. Such poor climatic conditions were unfavourable for fish breeding also, the yield of fingerlings in reserviors was also less.

- The Paddy fields didn't had sufficient water stored, the water resources also had poor supply of water and catla less fingerlings. The species variety found was mainly of – Clarias, channa few Rohu/Catla and Carp.
- The growth size was also poor, due to less water in fields, results in early fish harvesting due to comparatively high temperature, the fish and Paddy yield, both were poor. The average Paddy yield lead to down fall in socio-economic status of farmers.
- In some parts there were such adverse climatic conditions that 25% of land of farmers were kept unsowed because of very poor rainfall and high temperature.
- Here we can conclude that climate change was noticeable in 2016-17, which directly affect the socio-economic condition of farmers cum fisherman especially in case of Paddy cum fish culture.
- Year 2015-16 was profitable as compared to 2016-17.

Table 1

Year	Rainfall	Fingerlings Species	Seasonal Income from fishes	Rice yields	% of land used for Paddy cum fish culture
2015-16	996.3 mm	Rohu, Catla, mrigal, Clarias batrachus, Sawal, Channa, Padhin	6000-7000/-	15-16 qt. per acre.	80%
2016-17	723.1 mm	Rohu, Catla, Clarias batrachus, Channa, Carp	2500-3000/-	07-08 qt. per acre.	55-60%

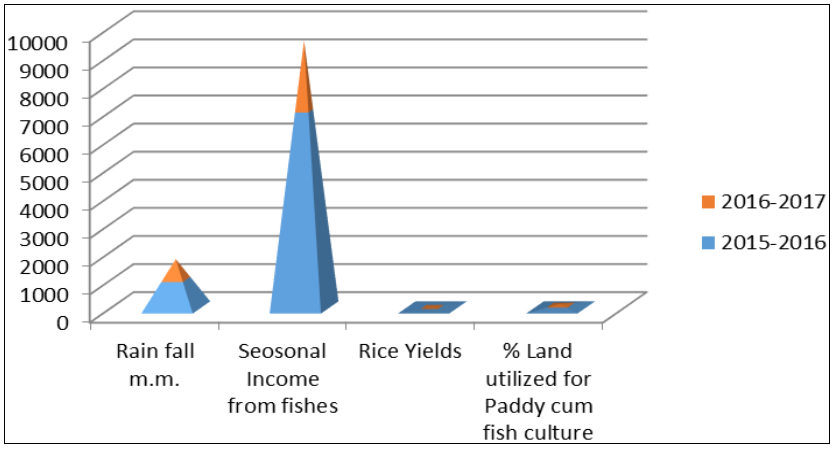

Fig 1

Picture Of 2016

Fig 3

Fig 4

Fig 5

Fig 6

Fig 7

Fig 8

Fig 9

Picture Of 2017

Fig 10

Fig 11

Fig 12

Fig 13

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