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Water harvesting and fisheries in poly-lined pond in temperate region under front-line demonstration

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Abstract
The soil of district Doda of Indian UT of J&K is very porous/sandy/silty/rocky and merely can store water even for a week, hence it is hard to reserve water by means of constructing an earthen type of pond. The water loss due to seepage from the earthen type pond can be controlled very much by poly-lining of pond. KVK-Doda brought ICAR-DCFR technology of constructing/converting seasonal pond into perennial pond by poly-lining under its Front-Line Demonstration (FLDs) programme and encouraged farmers for fish farming in these ponds. So far, we supported five poly-lined ponds to the five different farmers under front-line-demonstrations in the different villages of district Doda and stocked with Common carp (Cyprinus carpio). The average monthly growth rate as observed was 43.9 gm/month; final weight was 570gm/year with about 81% survival rate. The study of the cost/benefits ratio parameters indicated that there was an input cost (seed and feed cost) of about Rs. 1600/- (average) for one year operation of the above said pond, while the cost of the produced fish was about Rs. 13785/ per pond per year. Therefore, poly-lining of earthen pond or concreted ponds with cracks, are recommended for temperate regions where heavy water loss due to seepage is common. Poly-lining may not only ensure water availability round the year but can also increase farmers income several fold by providing table size fish to the market.

Keywords: Poly-lining, water conservation, Chinese carp, fisheries

Introduction
As we know water is most precious natural resource, it is important to conserve and manage it properly. Rainwater is the most important source of fresh water and there is need to manage the rain water so as to reduce the impact of moisture stress and obtain sustainability in agricultural production. Out of 400 million ha^{-m} precipitation in the country, 70 million ha^{-m} is consumed as evapotranspiration, 215 million ha^{-m} infiltrates into soil, whereas 115 million ha^{-m} is lost as run-off, resulting in drought in the catchment and flood downstream. Harvesting of one forth of this 115 million ha^{-m} run-off water in farm ponds can provide the irrigations to the entire rain fed area, which constitute two third of cultivated land of the country [1]. Harvesting of rainwater through surface storage is one outlet to combat the situation. Construction of farm ponds in individual farmer's field or on community basis for harvesting of run-off water when it is in excess and recycling of stored water for irrigation and other proposes when there is deficiency of water is a very effective and efficient method of facing the challenge of water scarcity in rain fed areas [2].

In India, we are traditionally using small man made or natural water bodies called pond, since ancient time. These water bodies have proper catchment/harvesting system and are used for drinking water supply, washing / bathing for human and animals, irrigating crops and raising fish. These small water bodies also play an important role in improving the ecological system and help to maintain biological diversity. Theses ponds are located on a variety of soil type, which exhibit a wide range of seepage characteristics. The seepage losses in some soil types are as high as 11 m^3 /s/ per million square meter area. Seepage losses not only mean loss of useful water but it also leads to other problems such as trench in the embankments, water logging or increased salinity in the adjacent area [1].

The water loss due to seepage from the earthen type pond can be controlled at high level by applying various techniques such as converting earthen pond to concreted pond; thick clay lining of pond; poly-lining of pond. Further, converting earthen pond into concreted pond is a costly venture that can not be afforded by the poor farmers, while clay-lining of earthen pond

is very cheap method for reducing water loss due to seepage, but the problem with this, is that in case of earthquake, the pond may get cracked resulting further water loss. Several researchers like Anonymous (1985) [3], Kumar *et al*. (2007) [4], Srivastava and Bhatnagar (1989) [5] suggested plastic lining of water bodies to increase water holding capacity for fisheries and other purposes.

Doda (coordinates-33°08′45″N75°32′52″) is a district in eastern part of Jammu Division of the Indian UT of Jammu and Kashmir with an area of about 2625 km2 and population of 409,936 (2011 census). The district have population density of 160/km2, sex ratio of 919. The soil of this district is very porous/sandy/silty/rocky and merely can store water in earthen type ponds for a week. Because of this nature of most of the soil of this district, it is hard to reserve water; this provides an opportunity of poly-lining of water harvesting ponds. There are several water harvesting cemented tanks constructed by the govt. departments, for several purposes excluding fisheries, while in most of these ponds there is problem of getting cracks one or two year later to its construction, because of the frequent earthquakes. With all above backgrounds, KVK-Doda brought a technology of constructing/converting seasonal pond into perennial pond by poly-lining under its Front-Line Demonstration (FLDs) programme**.** This paper deals with the fact of the results of FLDs conducted in five different places of the district.

Materials & Methods

We organized several awareness/trainings/demonstration programmes for dissemination of this technology in different villages, and launched this technology. So far, we supported five poly-lined ponds to the five different farmers under front-line-demonstrations in the villages namely Malnai, Poneja, Rounda (two ponds) and Gwari of district Doda. Among all the below tabulated five ponds (Table-1), three ponds were old one, concreted and cracked due to earthquake, while two others were new constructions and earthen types. The pond size, type, soil type, problem in the existing pond, date of installation of poly-sheet (Sylpoline, 200 GSM, blue color) and pond bottom treatment after sheet installation is given in the table-1.

Table 1: Basic information about the intervention made

S. No.	Parameters	Pond-1	Pond-2	Pond-3	Pond-4	Pond-5
1	Village	Malnai	Rounda	Gwari	Poneja	Rounda
2	Pond Size	24'x14'x5'	26'x16'x5'	27'x13'x5'	27'x17'x5'	27'x15'x5.5'
3	Type of Pond	Cemented (Old pond)	Earthen (new pond)	Cemented (Old pond)	Earthen (new pond)	Cemented (Old pond)
4	Soil type	Silt, rocky	Sand & Rocks	Silt & sand	Sand & Silt	Sand & Rocks
5	Specific problem in existing pond (if any)	Heavy cracks and therefore unable to hold the water even for 10 days	New Construction	Almost same as in case of pond-1	New Construction	Same as in case of pond-1
6	Date of Installation of poly-sheet	3rd May, 2017	31st May, 2017	27th June, 2017	20th July, 2017	20th July, 2017
7	Pond bottom type	A layer of about 6'' soil made available above the poly sheet to support natural production and to provide shelter				

All the ponds were filled with nearby source of water and fertilized with initial dose of 50kg of cow dung and left for about 15 days and thereafter stocked with Common carp (*Cyprinus carpio)* fry (200nos in each pond). The stocking and management details are given in the table-2.

Table 2: Stocking and management of ponds

S. No.	Parameters	Pond-1	Pond-2	Pond-3	Pond-4	Pond-5	Average
1	Date of Stocking of fish seed	3rd June, 2017	19th July, 2017	5th March 2018	9th August, 2017	5th March, 2018	-
2	Type of fish Seed	Chinese carp					-
3	Species	Common carp					-
4	No of fish seed introduced	200 nos.					200 nos.
5	Length at stocking (cm)	2.5	3.0	4.0	4.0	4.0	3.5
6	Weight at stocking (gm)	1.0	1.2	2.5	2.0	2.5	1.8
7	Type of feed given	Waste Maize flour	Waste Maize flour	Waste Maize flour	Waste Maize flour	Waste Maize flour	-
8	Pond Fertilization (if any)	About 50 kg of cow dung per month used to fertilize the pond and to produce natural food in the pond					-
9	Quantity of feed (gm)	10 gm/day and readjusted as per their weight					-
10	Feeding frequency (no of times in a day)	Twice (Morning & Evening)					-
11	Day of culture (in month)	17	15	8	15	8	12.6

Results & Discussion

Performance of the ponds at different months during the demonstration period are tabulated in table-3 and represented more specifically with figure-1 while the average values are with figure-2.

Table-3: Growth performance and survival of the fishes in poly-lined pond

S. No.	Parameters	P-1	P-2	P-3	P-4	P-5	Mean value
1	AMWG* (gm)	47	33.2	43.4	46.5	49.6	43.9
2	Final weight (gm)	800	600	350	700	400	570
3	Quantity of fish produced (Kg)	128	96	59.5	112	64	91.9
4	Survival (%)	80%	80%	85%	80%	80%	81

*Average monthly weight gain

The average monthly growth rate of fishes in different ponds in the table-3, shows the highest in pond-5 (P-5) and the lowest in pond-2 (P-2), which was due to different management level by the farmers and also due to different environmental temperature and water conditions at different villages in the district.

Figure-1 clearly indicates that there was a fluctuation in the final weight of the fishes, this is due to the difference in the study periods for different ponds. However the survival line is sleeping in position which indicates flat survival rate of about 80% for almost all the ponds. Similarly, quantity (in kg) of total fish produced also varies with day of culture.

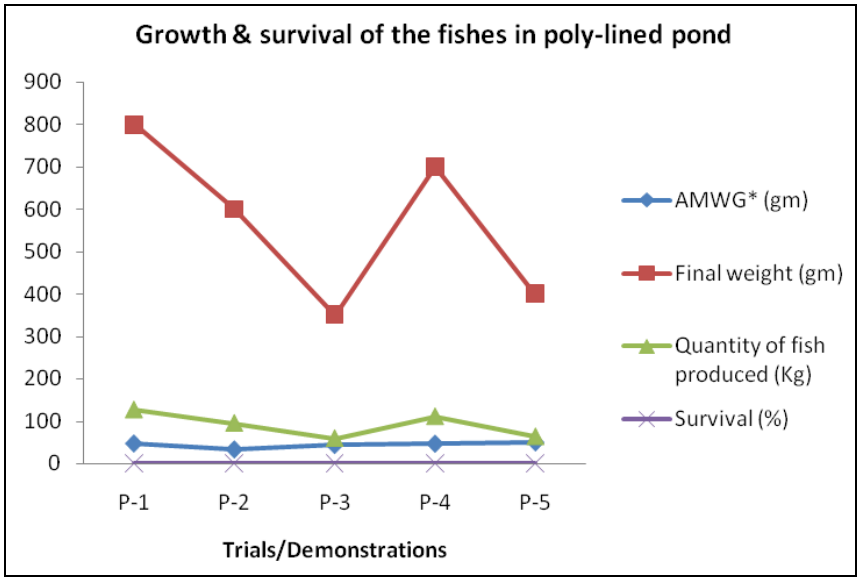

Fig 1: Value of the studied parameters

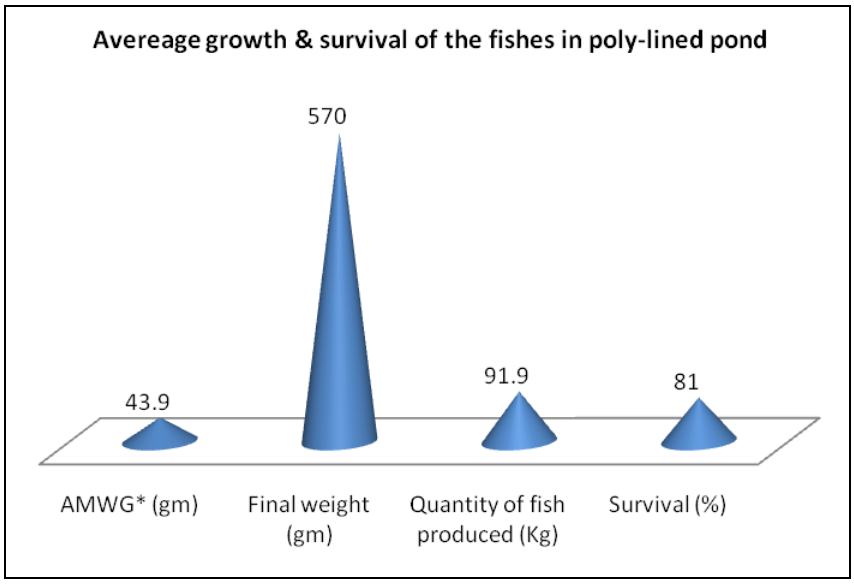

Fig 2: Mean value of the studied parameters

Mean values of all the studied ponds shows that there was a monthly weight gain of 43.9 g and achieving a final weight of about 570 gm of fishes (figure-2) in one year and is better for the fish farmers of temperate region.

Table 4: Cost/Benefits of fisheries in poly-lined pond

S. No.	Parameters	P-1	P-2	P-3	P-4	P-5	Average
1	In-put cost (Rs.)	2000	2000	1000	2000	1000	1600
2	Cost (Rs.) of fish produced (@150/KG)	19200	14400	8925	16800	9600	13785
3	Net return (Rs.)	17200	12400	7925	14800	8600	12185
4	Per month Income (Rs.)	1012	827	990	987	1075	978

Table-4 reflects cost/benefit from the fisheries in poly-lined pond in temperate region, while figure-3 compares the same. The input cost (seed and feed cost) for one year operation of the above said pond is about Rs. 1600/- (average), while the cost of the produced fish is about Rs. 13785/ per pond per year.

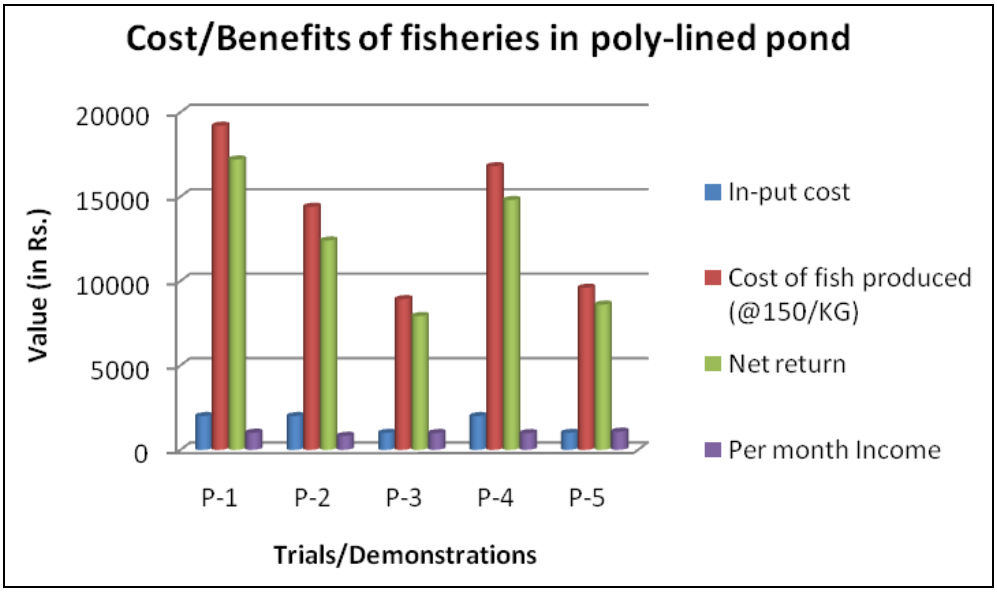

Fig 3: Cost/Benefit ratio of fisheries in poly-lined pond

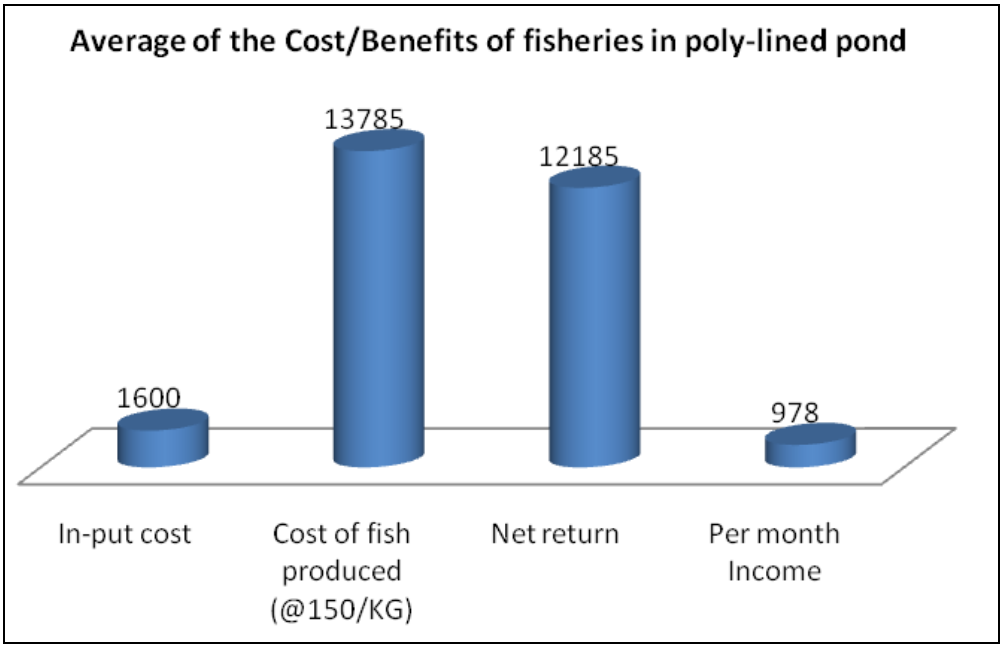

Fig 4: Average values of cost/benefit ratio

Hence, it is clear from the table-4 and figure-3 that there was more than 8 times more return over and above the investment from the fisheries in the poly-lined pond per year. Figure-4 reflects the average cost and benefits of the entire five demonstrated pond and it is clear that there is 860 percent return per year over the expenses in the poly-lined pond.

Conclusion

The soil of district Doda of Indian UT of J&K is very porous/sandy/silty/rocky and merely can store water even for a week, hence it is hard to reserve water by means of constructing an earthen type of pond. The water loss due to seepage from the earthen type pond can be controlled very much by applying various techniques such as by poly-lining of earthen or cracked concreted pond.

So far, we supported five poly-lined ponds to the five different farmers under front-line-demonstrations in the villages namely Malnai, Poneja, Rounda (two ponds) and Gwari of district Doda and stocked with Common carp (*Cyprinus carpio*). The average monthly growth rate as observed during the demonstration period of about one year was 43.9 gm/month; final weight was 570gm/year with about 81% survival rate.

The study of the cost/benefits ratio parameters indicated, there was an input cost (seed and feed cost) of about Rs. 1600/- (average) for one year operation of the above said pond, while the cost of the produced fish was about Rs. 13785/ per pond per year, and there was 860 percent return per year over the expenses in the poly-lined pond culture system.

Therefore, poly-lining of earthen pond or concreted ponds with cracks, are recommended for temperate regions where heavy water loss due to seepage because of the porous/sandy/silty/rocky nature of the soil is common. Poly-lining may not only ensure water availability round the year but can also increase farmers income several fold by providing table size fish to the market.

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References
1. Kumar Ashwani, Singh Rajbir. Plastic Lining for Water Storage Structures. Technical Bulletin No. 50, Directorate of Water Management, Chandersekharpur, Bhubaneswar-751 023, India, 2010, 34
2. Michael AM. Irrigation: Theory and Practices. Vikash Publishing House Pvt. Ltd. New Delhi, 1978, 801
3. Anonymous. A Manual on Canal and Reservoir Lining with Agri-film. Indian Petrochemical Corporation Limited, New Delhi, 1985
4. Kumar M, Kumar A, Singh SRK, Kumar N, Srivastava AK. Application of plastics in agriculture of NW Himalaya: Water harvesting and utilization, Technical Bulletin, 28(3/2007), VPKAS, Almora, Uttarakhand, 2007
5. Srivastava RC, Bhatnagar PR. LDPE film lined conveyance channel for hilly irrigation system. Indian Journal of Soil Conservation. 1989; 17(2):18-28