



Establishment of Machinery Bank for Attracting Rural Youth for Entrepreneurship Development

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ABSTRACT

Farm mechanisation has contributed significantly to the development of agricultural economy of Punjab but farmers with meagre resources at their command can't go further due to high price of machines. Providing the farm machinery services on rental as well as on custom hiring to the farmers is the most practical solution. Various models have been developed in order to select the optimum machinery and resources allocation to minimize cost and timeliness of agricultural operations. Availability of these machines at farmer's doorstep has been promoted under Central Sector scheme. The use of these machines is knowledge centric; therefore, hands-on training is very important. Sub-mission on agricultural mechanization is promoting custom hiring centres to offset adverse economies of scale arising due to small landholding and high cost of individual ownership. Paddy residue has emerged as a major challenge to the contemporary agriculture in Punjab as farmers generally resort to burning of this paddy straw in the field itself due to lack of time. Therefore, an attempt was made to establish machine bank for capacity development of rural youth in machine operation & maintenance and develop them as entrepreneur. Various machines were provided to the farmers for demonstrating the crop residue management technology at strategic locations. It was found that the model of Machine bank established is proving efficient model in attracting rural youth for entrepreneurship development in mechanisation. The concept of Innovation Hub proved an excellent way to diffuse in-situ technology packages at grass root level.

Key Words: Entrepreneurship, Innovation Hub, Machine Bank, Mechanization, Rural youth.

INTRODUCTION

Mechanisation in the Punjab agriculture has played a significant role in the rapid transformation of agriculture. Mechanisation has contributed significantly to the development of agricultural economy of the state; still most of the farmers with meagre resources can't afford due to high prices of machines such as tractors, combine harvesters, machines for management of crop residues etc. To overcome such problem and at the same time to get the advantages of mechanisation by the needy farmers for the costly machines and implements, various models have been developed in order to select

the optimum machinery and resources allocation to minimize cost and timeliness of agricultural operations. Such models were developed for selection of optimum farm machinery and power source so that the operations could be completed on time (Bector, 1997). Similarly, Recia *et al* (2001) developed a mixed integer programming model that consider optimal resource allocation and task planning for minimization of costs.

In order to provide machinery on custom hiring basis to farmers on time and at reasonable rates, the establishment of Agro-Service Centres was

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suggested (Sidhu and Vatta, 2012). A landmark step in this direction was the setting up of agro-service centres in Punjab with the twin objectives of providing self-employment to rural youth and custom hiring services to the resource-poor farmers but these got phased out due to farmers owning individually the small-powered machines. However, the new farm equipment, such as laser levellers, which are highly costly, low annual use and require high-power tractors have become the demand of the present agriculture. The Punjab State Farmers Commission took the initiative to strengthen the Primary Agricultural Cooperative Societies (PACS) by providing one-time capital assistance as subsidy to own the costly machines and equipment and work as Cooperative Agro-Service Centres (CASCs). Singh *et al* (2013) elaborated that custom hiring improved the net income of the farmers through reduction in input costs, however, the productivity of major crops was higher in tractor owning farms due to the timely availability of services. Sidhu and Vatta (2012) revealed huge popularity of AMSCs for timely availability of services at reasonable rental rates in comparison to private players. Singh (2018) reported a high level of satisfaction among farmers who used custom hiring services from PACS on account of timely availability and lower cost. However, the longer period for achieving economic viability despite plenty of demand for farm machinery services was an area of concern. Satyasai and Balanarayana (2018) strongly favoured establishment of organized custom hiring centres and technology-based solutions that can professionalize farm mechanisation space.

Sub-mission on Agricultural Mechanisation (SMAM)– a boost to mechanisation

Government of India initiated Sub-mission on Agricultural Mechanisation (SMAM) in 2014 and revised in 2019 with major focus on ‘Promoting custom hiring centres to offset adverse economies of scale arising due to small landholding and high cost of individual ownership’ (Anon, 2019). SMAM provides suitable financial assistance to rural

entrepreneurs, progressive farmer and Self-Help Groups (SHGs) to establish Farm Machinery Banks for Custom Hiring for appropriate locations and crops. Further, realising the extent and significance of the problem of crop residue burning, Government of India launched Central Sector Scheme on “Promotion of agricultural mechanisation for *In-situ* management of crop residue in the state of Punjab, Haryana, Uttar Pradesh and NCT of Delhi” in 2018. The scheme aimed at holistic promotion of agricultural mechanisation for *in-situ* management of crop residue through awareness and capacity building. Under this scheme, there was a provision for subsidy for individual farmers (50%) to purchase required machinery and 80 per cent subsidy for establishing custom hiring centres (CHC) by a group of farmers.

Among the scientific crop residue management options, *ex-situ* management of paddy residue is essentially the mining of essential nutrients from the field and should be avoided. However, *in-situ* management involves either retaining the residue on field as a mulch while sowing the succeeding crop with happy seeder or zero-till drill or mixing/ incorporating residue in the soil using reversible plough, disc plough or rotavator. The type of management and machines to be used can be chosen based on the requirements of the succeeding crop. Jaidka *et al* (2020) reported that *in situ* crop residue incorporation techniques were followed by a maximum of 34 per cent farmers and Happy Seeder technology took only 2.42 hr to sow an area of one hectare as compared to 10.02 and 11.75 hr for residue incorporation involving a sequence of operations comprising either disc harrow-rotto drill or disc harrow-seed broadcast-rotavator.

Looking in to the seriousness of the issue of residue burning in Punjab, Krishi Vigyan Kendras (KVKs) of Punjab under the aegis of the ICAR-ATARI, Ludhiana started pioneering work by promoting farm machinery for *in-situ* residue management and drew attention of all the stakeholders to the problem of residue burning.

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Machinery for *in-situ* residue management was the pre-requisite as most of the farmers did not have it for the same.

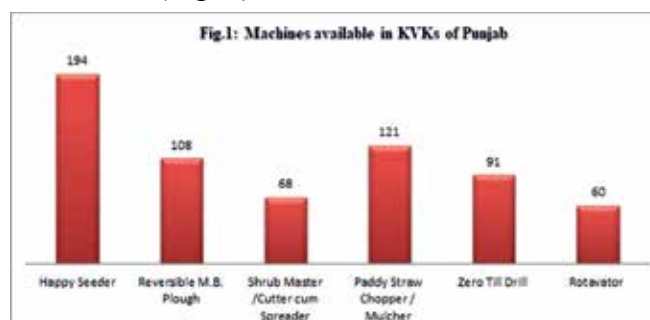
Concept of Machinery Bank at the Krishi Vigyan Kendra

Agricultural mechanization, when coupled with business model in the form of Machinery Banks (MB) can attract rural youth towards agriculture as service providers. Bhattarai *et al* (2018) stated that like spread of tractors in India, agricultural mechanization can also spread through custom hiring services even in small holder dominated farming society. Hiring machinery services provides substantial economic benefits to the farmers compared to owning the same machines. Custom hiring resulted in to 26 per cent higher operational costs but saved about 63 per cent on fixed costs (Singh *et al*, 2014). Likewise, there was a need to enhance the number of such centres because of the small radius of the area covered by the existing centres (WAPCOS, 2018) which later on can be translated into uberization for agricultural machines i.e. availability of machines at farmers' doorsteps. Hence, Machinery bank in each KVK was established to address crop residue burning which required adoption and use of newly designed machines by the farmers. Moreover, lack of skills may also prevent farmers from adopting or purchasing machines as they may find the technology complex and tricky. Therefore, capacity building of farmers and machine operator was considered fundamental not only to ensure the timely operations and efficiency in machine usage but also in terms of developing confidence among farmers and machine operators. Machine bank in KVKs provided these machines free of cost to the farmers who did not want to burn the paddy straw. It also helped in the development of rural entrepreneurs who want to establish CHC on agricultural machinery. The ultimately machine bank helped the KVKs for laying out demonstrations at strategic locations at large number of farmers' field.

MATERIALS AND METHODS

Establishment of machine banks at the KVKs

AMB was established at each KVK of Punjab for organising capacity development, demonstrations, exhibitions as well as providing services to the farmers of the command area. There were 194 Happy Seeders, 108 reversible Mould Board Ploughs, 68 Shrub Master/Cutter cum Spreader, 121 Mulcher/Chopper, 91 Zero Till Drills and 60 Rotavators (Fig. 1).



Development of Innovation Hub in villages for rural entrepreneurs

The concept of Innovation Hub (IH) was introduced with sole objective to develop rural entrepreneurs in the process who can establish CHC in their villages to provide the machinery to fellow farmers of adjoining villages for adoption of these technologies (Fig. 2). Each KVK of Punjab identified one village for developing an Innovation Hub so that the village could cater the technological and information needs of farmers of neighbouring villages and promote Farmer to Farmer Extension (F2FE). KVK scientists regularly visited this village and convincing farmers for adoption of *in-situ* crop residue management technologies.



Fig. 2: Model of Innovation Hub village

KVK also provided machinery to IH village so that they can use this machinery and train other farmers. This model of innovation hub has played significant role in promoting agricultural machinery for in-situ crop residue management. In some cases, farmers from remote villages located at International border (who never seen such machines) also visited innovation hub villages and used the machinery for in-situ residue management. The IH villages has become Zero residue burning villages and inspired farmers of the neighbouring villages for adoption of machinery for residue management. In this process, 252 villages declared as residue burning free villages which has not burnt 80 per cent or more paddy area. These Innovation Hubs proved to be very effective in dissemination of technologies at large and this model has the potential to be replicated in different regions of the country.

RESULTS AND DISCUSSION

During last three years, KVKs of Punjab organised more than 365 hands-on five days training programmes in which more than 9500 rural youth, farmers, tractor owners, etc participated. The trainees were specifically informed about the combo technology of Super Straw Management System (Super-SMS) and Happy Seeder and its multiple advantages. Farmers were given literature on effective usage of machines in the field, certain specific tips, do's and don'ts etc. Separate Question-Answer (Q&A) sessions were conducted to clarify doubts in terms of using machines. Similarly, live method demonstrations on operating machines and sowing wheat while managing paddy straw effectively have been organised. Result demonstrations on Happy Seeder sown wheat, Zero-Till drill sown wheat, etc. were also organised at strategic locations at the farmers' fields to exhibit actual field conditions while managing crop residue *in-situ*. Thus, demonstrations in the farmers' fields on different *in-situ* residue management technologies were conducted on 21,500 ha while obtaining participation of more than 32,000 farmers.

Supply of machines to the farmers on custom hiring basis

During the period under study, each KVK of Punjab provided different machines to the farmers of the area for managing loose paddy straw obtained after using the combine harvester which farmers also procured on custom hiring basis. The requirement of machines was based on the cropping sequence followed in an area. Under rice-wheat cropping system, farmers used to go for happy seeder or super seeder whereas under three crops rotation system, farmers hired MB plough, disc harrows, rotavator etc. Similarly, in area where paddy straw was taken away for feeding of animals, farmers preferred to go for zero till seed drill for sowing of wheat crop. However, it was noticed that availability of machines nearby the farmers' field was the main factor for adopting its utilization in order to manage paddy straw. Further, small farmers who did not possess his own tractor, only those resorted to partial burning of paddy straw. The data indicated the variations amongst the districts in using different kind of machines after obtaining from the concerned KVK (Table1).

The machine banks have been established in all the 22 KVKs of Punjab for *in-situ* crop residue management. These machines have been supplied to the interested and needy farmers of the area on custom hiring basis during 2019-20 and 2020-21. The data (Table 1) clearly revealed that 4633 famers of Punjab had taken happy seeder from machine banks of KVKs for sowing of wheat on 7,298 ha area in standing paddy stubbles. More than 2,500 farmers used mulcher and covered 3,897 ha area for creating layer of paddy straw as mulch. In case of reversible M.B. plough, 1,932 famers had taken it from KVKs and covered 3388 ha area for incorporation of the residue in the soil. More than 950 famers used rotavator and covered 1942 ha area. Zero till drill used by 2974 famers from KVKs for direct sowing of wheat whereas 983 famers used shrub master/ cutter-cum spreader and covered 2258 ha area.

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Table 1. Supply of different machines to the farmers of the area on custom hiring basis by different KVKs during 2019-20 and 2020-21.

Name of KVK	Happy Seeder		Paddy straw chopper/ Mulcher		Reversible MB Plough		Rotavator		Zero till drill		Shrub master/ cutter	
	F	A	F	A	F	A	F	A	F	A	F	A
Amritsar	529	525	145	135	80	115	40	65	212	230	80	115
Bathinda	647	963	104	166	121	203	120	202	276	621	100	206
Faridkot	181	578	130	381	101	240	126	632	250	997	143	482
Fatehgarh Sahib	530	561	195	209	200	214	50	60	285	289	30	32
Ferozepur	305	230	480	380	162	116	110	90	310	250	0	0
Gurdaspur	224	555	37	76	33	63	66	190	41	114	24	43
Hoshiarpur	165	174	40	52	45	64	80	101	75	104	70	97
Jalandhar	45	144	70	120	150	328	15	20	75	160	10	16
Kapurthala	121	148	275	858	275	858	16	26	26	33	37	46
Ludhiana	108	235	298	326	90	164	53	78	39	48	86	104
Mansa	90	329	43	129	27	27	17	19	111	217	48	155
Moga	303	480	193	232	193	232	60	117	278	337	25	42
Muktsar	201	213	140	166	50	46	20	20	400	452	135	306
SBS Nagar	400	400	145	225	90	148	70	113	100	184	0	0
Pathankot	30	57	45	70	11	42	12	44	120	336	0	0
Patiala	51	343	10	42	21	99	6	20	13	42	38	165
Ropar	245	345	70	93	195	275	35	47	155	224	50	62
Sangrur	47	155	31	85	15	43	0	0	1	1	26	116
Barnala	39	202	8	24	9	25	3	12	12	29	15	181
Mohali	6	6	23	13	25	11	33	47	112	124	20	12
Tarn Taran	264	581	19	43	14	13	21	39	33	59	6	8
Fazilka	102	74	25	72	25	62	0	0	50	50	40	70
TOTAL	4633	7298	2526	3897	1932	3388	953	1942	2974	4901	983	2258

F= No. of farmers; A= Area covered (ha)

Scope of income and employment generation

The Machine Bank (MB) or Custom Hiring Centre (CHC) is an innovative solution for farm mechanisation and has tremendous potential increasing the income of farmers as well as employment in rural areas. These banks served a bigger purpose by ensuring availability and accessibility to crop and location specific equipment, facilitated timeliness of farm operations and

efficient use of inputs, adoption of climate resilient practices, reduced drudgery, enhanced use of modern technology, machines and efficient farming techniques which boosted productivity. Alongside, it provided the owners with an opportunity to move into off-farm remunerative venture as service provider to the farming community.

There are several case studies and success stories which indicate that CHCs/MBs were essential for

farm mechanisation and in generating employment in rural areas (Singh *et al*, 2017). In Haryana, farmers and unemployed youth were motivated to use machinery and equipment on custom hiring basis as an enterprise. The model of custom hiring centre of zero-till, seed-cum-fertilizer drills, farmers and young unemployed rural youths purchased 8,480 machines up to 2004-05. Total earning was estimated to be Rs 10,000–12,000/year/machine with pay-back period of two years and resulted into 70–80 per cent saving in fuel. The model proved very efficient and total area covered by zero-till drill in Haryana was about 5 lakh ha during 2004-05. In another model of custom hiring business of rotavators, it has been reported that farmers and unemployed rural youth who were engaged in custom hiring of rotavators got an average net profit of Rs 101,625/year by charging Rs. 1000-1500/ha with an average coverage of 125-130 ha/year indicating that the pay-back period of rotavator in one season. Similarly, farmers and rural youth were motivated to buy high-capacity multi-crop thresher and adopt custom hiring business. The net saving per year was estimated to be Rs 86,000 and the pay-back period was one year, however, the capacity of machine varied from crop to crop, make and models (Anon, 2007).

CONCLUSION

It was concluded that efforts should be made to encourage rural youth to start Machinery Banks and support them both financially and technologically to successfully provide the services to the farming community. Thus, there is need for *Uberization* so that all the MBs as well as individual machine owners can be linked with this App and farmers can book machinery for a particular operation on a particular date and time.

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