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Role of conservation agriculture and agricultural mechanization on productivity, sustainability and income generation in north west India

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Abstract **:** Agricultural mechanization and conservation agriculture refers to interjection of improved tools, implements and machines between farm workers and materials handled by them. Independent India ushered in a process of agricultural mechanization and revival of rural agro processing which got acceleration during post-green revolution period. Irrigation pump sets, power threshers, tractors, power tillers and matching implements, including for 65 million draft animals have became popular. Seed and seed-cumfertilizer drills, planters, mechanical rice transplanters, vertical conveyor reapers,and combines soon followed. In the recent past, zero-till drill and raise bed planters, laser land leveler, turbo happy seeder have found good acceptance from the farmers. Currently mechanization is in increasing demand. Farmers and policy makers and developmental agencies now realise that for increasing productivity and sustainability at reduced unit cost of production, free of arduous labour, agricultural mechanization is essential. It is brought in centre stage with globalization of world markets.Shifts in agriculture leading to crop diversification towards horticulture,animal husbandry, fishery and forestry are going to bring in greater degree of mechanization.Western Uttar Pradesh dominated by small and marginal land holdings may not have same trend of mechanization as the developed world but it is going to grow close to it with its own variant as labour wages go up and WTO competition compels us to keep reducing unit costs of production,processing,packaging,and retail and situations demanding provision of custom servicing, custom agro-processing and acceptable standards of living. The conventional mode of agriculture through intensive agricultural practices was successful in achieving goals of production, but simultaneously led to degradation of natural resources. The growing concerns for sustainable agriculture have been seen as a positive response to limits of both low-input, traditional agriculture and intensive modern agriculture relying on high levels of inputs for crop production. Sustainable agriculture relies on practices that help to maintain ecological equilibrium and encourage natural regenerative processes such as nitrogen fixation, nutrient cycling, soil regeneration, and protection of natural enemies of pest and diseases as well as the targeted use of inputs.Agricultural systems relying on such approaches are not only able to support high productivity, but also preserve biodiversity and safeguard the environment. Conservation agriculture has come up as a new paradigm to achieve goal of sustained agricultural production. It is a major step toward transition to sustainable agriculture. Agriculture has always been taken for granted, over recent years the discussion has shifted to the 'crisis' being faced with'concerns' raised about the 'reality' of the situation and what needs to done.We all know that these developments have been influenced by human actions and have not emerged as an over night phenomenon. Thus, it is to be expected as with any deteriorating situation, the solution sought/ professed may be equally strong, and many a times bordering on the impractical. It is in such a scenario that conservation agriculture (CA) is trying to find its feet within India. The world over, CA has gained ground due to the stated balance, it has been able to achieve between needs of productivity and sustainability. With its basic approach directed at conserving resources and maintaining productivity, most would agree that it can offer a way forward to attain goals of sustainable agriculture. Several studies have indicated that there was significant increase in cropping intensity due to the use of tractors and irrigation as a consequence of mechanization.The increase in cropping intensity has been reported to be 165, 156 and 149 per cent for tractor-owning, tractor using and bullock operated farms, respectively. Furthermore, the per cent gross cropped area irrigated was positively related to cropping intensity.The facilities of tubewell irrigation and mechanical power helped the farmers in raising the cropping intensity of their farms concluded that cropping intensity was mainly dependent on annual water availability and the farm power available. It was also reported that the States like Punjab, Haryana,Western Uttar Pradesh which had higher per cent irrigated area, higher doses of fertilizer and higher power availability per hectare also had higher grain yield per hectare. The studies regarding effect of agricultural mechanization on

human labour employment have shown that agricultural mechanization helped in overall increase in the employment of human labour. The reduction in aggregate labour used on tractor operated farms was quite nominal (1.3 to 12%) as compared to bullock operated farms. The increase in employment of casual male labour was reported to be upto 38.55 per cent. There was slight decline in the employment of casual labour.To sum up, agricultural mechanization studies had shown that farm mechanization led to increase in inputs due to higher average cropping intensity, larger area and increased the productivity of farm labour. Furthermore, farm mechanization increased agricultural productivity and profitability on account of timeliness of operations, better quality of work and more efficient utilization of crop inputs.Undoubtedly, farm mechanization displaced animal power from 60 to 100 per cent but resulted in less time for farm work. Also mechanization led to increase in the human labour employment for the on-farm and off-farm activities as a result of manufacture,repair, servicing and sales of tractors and improved farm equipment.

Key words **:** Conservation agriculture, Productivity, Sustainability

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