

Small Scale Mechanization Could Transform Mid-Hill Economy of Nepal

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Abstract

Improved crop varieties, fertilizer, irrigation, pest control and farm mechanization are essential inputs for achieving high crop yields and farmers' income. However, in mid- and high hills of Nepal, geographical barrier of rugged topography and inaccessibility to reliable public transport, electricity, market centres, and simplified credit lending schemes are considered to be the major non-technology related obstacles to farm mechanization. With the start of political instability in 1996, mass migration of youth from rural areas occurred resulting into severe shortage of farm workers especially in mid- and high hills. This trend, since then, has continued with outflow of rural youth to overseas for better employment opportunities. As a result, aged farmers have become custodians of farmland. Many farms are left uncultivated leading to soil erosion and deterioration and ultimately may turn into marginal lands unsuitable to farming in future. However, recent positive developments in mid- and high hill areas for rural road, extension of electricity and communication network, including mobile phones, landlines and internet are encouraging. Moreover, Government of Nepal has recently proposed Agricultural Mechanization Policy in order to make available farm machinery and parts. Furthermore some new agricultural graduates and people are returning from foreign employment and taking up farming occupations and creating a new wave of commercialization in agriculture. We believe that this is high time for NRNA-NCC Australia and NRNA-ICC** to do something for agricultural development of motherland. Even small efforts with good intention would be enough to bring tangible positive impacts in small scale agricultural projects. We propose that NRNA[†] Australia create a core team comprising of experts with skills and knowledge on cropping systems, CA and mechanization from NRN^{††} communities in Australia and other countries. The core team would then conduct feasibility study for establishing the potential model farms in some mid-hill locations where NRNA team of expert would be working together with local farming communities and stakeholders for the transfer of skill, knowledge and innovation across wider farming community.*

*Non Resident Nepali Association-National Coordination Council; ** Non Resident Nepali Association-International Coordination Council; [†]Non Resident Nepali Association; ^{††}Non Resident Nepali

AGRICULTURE IN NEPAL

Agricultural sector in Nepal has potential to provide employment and livelihood opportunities for farmers and rural people and also has a major role in leading growth of country's economy. However, farmlands are fragmented and farm sizes are small especially in mid- and high hills, which can pose both opportunities and challenges for planning and operation of small-scale mechanization. Moreover, rugged terrains, lack of agricultural roads, and terraced farm topography pose further challenges for machinery introduction and promotion. Government programs to introduce irrigation facilities and fertilizers have proved inadequate; their delivery hampered by the rugged mountainous terrain. Population growth and environmental degradation have caused minimal gains in agricultural production, owing more to the extension of arable land than to improvements in farming practices. Production of most crops particularly that of cereals, has been consistently decreased. Once an exporter of rice, Nepal now is a net importer. As most of the country is mountainous, there are pockets of food-deficit in most of the remote districts, and this is quite severe in the Western region. Citing high cost factors on transportation from Tarai to hilly regions, businessmen often prefer to export food products across the border to India often aggravating food crisis in remote districts.

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However, in the last 10 years, there have been some encouraging developments in mid- and high hill areas. Rural road network and electricity have been extended in the mid-hill and some parts of high hill. Moreover, there has been incredible progress in communication network. Meanwhile, Government of Nepal (GoN) has recently proposed agricultural mechanization policy which aims to make available farm machinery and parts to farm entrepreneurs for purchase and repair. Success stories of some new agricultural graduates and people returning from foreign employment taking up farming occupations have been published by broadsheet newspapers. Dairy, poultry, goat, vegetables and pig farms have been proven to be profitable and such farms can be seen in the areas surrounding cities and town centres. In order to retain such a positive move toward commercialization in agriculture, GoN needs to address root causes that are dragging mid-hill farmers to emerge from subsistence farming.

CURRENT STATUS OF AGRICULTURAL MECHANIZATION AND CONSERVATION AGRICULTURE IN NEPAL

A census carried out in 2001-02 has shown that the proportion of farms using tractors and threshers was less than 10% in comparison to farms who used pump sets/motors for irrigation of 14.3%. Only 1.97% farms used power tillers and 26.1% of farm households used iron plough indicating that power tillers were not as popular as tractors and threshers. The 2011-12 Census also showed similar trend; there were less than 1% farms using power tillers but 28.01% farms using iron plough-the most basic farm tilling technology. Likewise, only 22.04 percent farm households used tractors and 20.96 percent

used threshers. In pursuant to such a poor growth of farm mechanization GoN has tabled a draft of the Agricultural Business Promotion Act, which aims to ensure market access to farmers and attract private sectors in commercial agriculture, envisages contract farming provisions and farm mechanization.

By virtue of topography, farmland in the mid and high hill is sloping up to 30%, where terrace farming is the most common practice. In such a situation, soil erosion during monsoon is the most serious problem. Loss of fertile top soil by wind and water is a great challenge to retain productivity in such a sloping land. Conservation Agriculture (CA) and farm machineries have been successfully practiced in low-lying areas of south and southeast Asia but there are no or negligible reports on practising CA on hilly areas although farm machines have been used in many hilly areas of China, India and South Korea. In Nepal, CA and small tilling and planting machines have recently been introduced by CIMMYT (International Maize and Wheat Centre) in a mid-hill district of Palpa in western Nepal.

CA is an approach to production system management; it complies with the notions of sustainable production intensification. CA consists of three basic principles or components: no or minimum soil tillage; partial or full use of crop residues; and sustainable crop rotations. Thus, for the establishment of rainfed and irrigated crops at field level and for up-scaling of rain fed or irrigated CA systems, including arable systems, crop-livestock mixed-farming systems, or horticulture systems, or plantation systems, the approach requires specific mechanization measures to allow crops to be established with no or minimum soil disturbance, to protect top soil by organic cover, and to manage crop rotations and soil and agro-ecosystem health. CA together with sustainable mechanization keeps up soil health and significantly reduces soil erosion. Despite budgetary subsidies to purchase and use farm machines like power tillers, harvesters, planters and seed drills, and herbicides and pesticides sprayers, participation of youth in the farm sector, particularly in the mid- and high hills, is still dwindling because the sector is not much attractive due to unavailability of clearly profitable farming technology.

WHY MECHANIZATION OF HILL FARMS AND CA ESSENTIAL?

The low agricultural productivity is often cited because of poor state of farm mechanization, uneconomic farm size and inadequate & untimely delivery of farm inputs and support services. As a result, farming has not been perceived as a prestigious and profitable occupation. While the majority of farms are occupied by small and marginal households in the mid-hill, the trend of agricultural lands remaining fallow is increasing. Since largely subsistence agriculture does not create year-round employment opportunities for rural people, most youth migrate to city centres and overseas for jobs. This has created a shortage of manpower during peak operation seasons such as planting and harvesting. This in turn has created additional problems in rural Nepal: (i) reduction of agricultural production and (ii) additional burden to elderly, women and children creating imbalance in family and social lives.

Experiences from the recently mechanized neighbouring countries such as India, Bangladesh and China reveal farm mechanization as a crucial input for improving agricultural production. Without farm power and appropriate tools, implements and machines farmers would struggle to emerge from subsistence farming. Following increased demands for food and agricultural products already straining existing natural resources base, urgent need of developing production systems with integration of sustainable mechanization has been obvious. As mechanization promotes farm intensification, mechanization and sustainable intensification with CA would pave way to future farming as a business enterprise. Sustainable intensification implies protection of natural resources and ecosystem hand-in-hand with intensified food and fibre production practices and methodologies. Thus, farm mechanization

and CA form an integral plank in the implementation of sustainable crop production and intensification approaches.

CHALLENGES AND OPPORTUNITIES OF MECHANIZATION AND CA IN HILLS

Small Scale Land Holdings

Arable land cultivated in Nepal is only 21% of the total physical land area. This land mass is concentrated in the southern Terai plain and mid-hill region. The National average size of farm holding is 0.96 ha of which mountains and high hills have 0.68 ha, mid-hills have 0.77 ha and Terai has 1.26 ha. The national average parcel size is 0.24 ha and average no. of parcel holding is 4 (NGO Federation). Moreover, High Level Commission on Scientific Land Reform (2010) has categorized farmer groups based on size of farmland ownership; Landless and marginal farmers (33% household) have less than 0.3 ha average farm size, small to medium farmers (63% household) have 0.3 ~3.0 ha farm size, large farmers (3.3% household) have 3.0 ~10.0 ha farm size and extra-large farmers (0.1%) household have greater than 10 ha farm size. In a study conducted by Nepal et al (2009) in Eastern Nepal, it has been concluded that farm mechanization is the most influential factor in agricultural commercialization in Nepal. The contexts clearly justify rationale behind authors' call for small scale mechanization and conservation farming in order to commercialize small to medium farm size in the mid-hills. Moreover, rugged terrain of mid-hills, lack of agricultural roads to most farm lands, and terraced farm topography poses different challenges in the machinery introduction and promotion as compared to the Terai plain.

Land Lease and Contract Farming in the Mid-hills

Contract farming initiatives could provide producers easier access to market and credit facilities. Furthermore such initiatives create avenues for land consolidation. GoN has envisaged such initiatives in the proposed Agriculture Business Promotion Guidelines. After implementation of the proposed guidelines, it will bind both buyers and producers legally; they can claim reparation if any of the parties breach the contract. This provision would largely support commercial agriculture. The existing law fails to address leasehold farming practices since land owners are reluctant to allow tenants cultivate their land for continuous long-term, fearing the leasers might claim tenancy. Thus the proposed guidelines can address problems related to land leasing and are also expected to increase land productivity through optimum utilisation of land and water resources. With contract farming, mechanization can help both land owners and leasers for the production and processing of crops timely. In the near future, mid-hill cereal farmers will have to compete with high value crops in terms of value of their land and irrigation water being used for cultivation. Hence they will need to adopt mechanization and follow contract farming and commercial agriculture.

Support Systems for Farm Inputs and Services

Currently agricultural support system in Nepal is very primitive in nature. There is lack of comprehensive policies for agrarian reform and associated farm inputs (seed, fertilizer, pesticides, etc.) and support services resulting in low productivity. As a result, farming has not been perceived as a socially prestigious and profitable occupation by general public. To retain productivity of resources including land and water, support systems, including agricultural extension services, delivery of farm inputs and

credit lending schemes have to be modernized. Extension should be service-oriented and be quick in providing targeted response to a call for help. Inputs should be delivered timely in adequate quantity and small credit lending schemes be developed without the need of collaterals. Some of the resources that are currently poured on policy and programs targeting food security could be diverted to strengthening such support systems so that overall agricultural productivity enhanced and resultant tangible outcomes would address country's food security issues in the long-term and more effectively.

SOME PARADIGM SHIFTS

In recent years, there have been some changes in attitudes, thinking and practices in the farming sector in Nepal. For example, new agricultural graduates are gradually adopting farming and have emerged as new generation farm entrepreneurs in dairy, poultry, goat, vegetable and pig farming. Farming is also gradually attracting Nepalese returning from overseas employment. Many of them carry new skill, knowledge and capital to invest in small to medium scale agri-business. If such wave of commercialization could be maintained in mid hills where problem of low productivity is prevalent, a great many youth would be attracted to the farm entrepreneurship. In addition, recently the GoN has also been active to promulgate and enact Agricultural Mechanization Policy Nepal. It has been anticipated that the policy will bring positive changes to availability of farm machinery with easy access to purchase as well as repair and maintenance. All these changes have great potential to initiate and promote farm mechanization and CA.

A PROPOSED MODEL FARM: MECHANISATION and CA

As per guidelines and the project developed by NRNA Australia NCC and NRNA ICC and based on the recommendation by the project core team, initially a few model farms will be chosen in the representative mid-hill regions of Nepal. These model farms will be used to disseminate skill, knowledge, and innovation on major staple crops- maize, rice and wheat. The project will initially start with only a few model farms so as to gain confidence of all stakeholders and will be replicated in a number of farms in the subsequent years.

Rice-wheat and rice-maize systems are dominant cropping systems in the irrigated fields of mid-hill, often receiving priority attention by farm entrepreneurs. In the first step, experts and farm entrepreneurs will conduct community participatory adaptive trials with mechanised planting and harvesting of maize, rice and wheat. This will be tested together with CA technologies such as crop rotations, stubble retention, and minimum tillage by introducing round-up ready and basta group of herbicides for weed control. GOs, NGOs and private sector working in the area will be involved in supplying seeds, fertilizers, machines, chemicals and marketing of farm produce. The CA machines that could be used would be tilling and planting machines (small-sized power tillers; smaller-sized power tiller operated seeders), weed control machines (small machines for controlling weeds; sprayers for spraying herbicides such as Roundup and many other herbicides often used in CA), and harvesting/threshing and post-harvest machines (small-scale harvesters, threshers, combines, maize shellers, etc.). The cultivation technology to be tested could be residue management of maize, rice and wheat (complete residue retention; partial residue retention; no residue retention, etc.) using the planting machines. In rice, direct seeded rice (DSR) would be a potential technology as it is less labour intensive and CA friendly.

Conservation farming with the use of appropriate machinery would an integrated package of NRNA SKI transfer model which could have a great potential in the mid-hills because of numerous technical and socio-economic reasons mentioned above. Such a technology has been proven successful in similar geographic and socio-economic settings of India (Himanchal Pradesh) and South Korea. As such an integrated package has not yet been practiced at a commercial scale in Nepal, we acknowledge that expertise is limited locally to kick start such an innovative project. Hence NRNA Australia with the help of global NRNA experts on mechanization and conservation farming could contribute their skill and knowledge significantly to this project. Once the project succeeds in the model farms, it will multiply at commercial scale in numerous farms and have real potential to impact on the mid-hill economy of Nepal.

MECHANISMS of SKI TRANSFER BY NRNA

In this regard, Non-Resident Nepali Association (NRNA) could have a great role to play. NRNs living in different countries could work toward developing working models and partnerships for transfer of initiatives as mentioned above so that hill farming can be commercialised, profitable and sustainable. We propose that NRNA Australia take initiatives in creating a pool of experts on cropping systems, farm mechanization and CA from among NRN communities in Australia and other countries. Based on that pool, a core team could be formed who, together with local experts, stakeholders and farmers, could then carry out feasibility study and select a few farming communities in representative mid-hill locations in Nepal. Such communities should be willing to develop their farm as a model farm for mechanization and CA in future. The NRNA core team should also discuss with local stakeholders including government bodies, NGOs, private sector, local businesses and farming communities about how expertise of NRNs could be better utilized. The team should review and assess successful case studies of small scale farm mechanization of hill agriculture of India (e.g. Himanchal Pradesh), South Korea and China and will also visit and learn about the CA and mechanization works initiated by CIMMYT-Nepal in the Palpa district. With the recommendation from the core team assigned for this task, application to external donor for funds which could be used by the project to purchase small scale farm machinery infrastructure for the selected model farms. Streamlining coordination of all stakeholders, the model farms could be developed into major learning hubs to mid-hill farm entrepreneurs for CA and farm mechanization. Once NRNA-NCC Australia demonstrates such initiatives in mechanization and CA, then it could share such skills and knowledge through various training sessions, using its core pool of experts via model farms. Thus, there would be effective SKI transfer from NRNs residing overseas to farmers in Nepal. And also there would be SKI exchange across various stakeholders including policy makers and farming communities in Nepal.

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