Some Socio-economic and Environmental Impacts Of Animal traction as an Intermediate Technology In Rural Development: An Example from Sudan

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Abstract: Animal traction (as intermediate technology) has been widely spread since a long time throughout Africa, Asia, and Latin America. There are considerable differences in level of development and types of the technology as well as differences between the areas in which it has been introduced. Animal traction equipments are used in agricultural operations (i.e. plowing, leveling, seeding, harvesting, and crop threshing), as well as for transportation (i.e. animal carts).

In the last three decades, animal traction technology has been adopted in different rural development projects in Sudan, as an intermediate alternative to the very traditional and modern technologies. The idea mainly aimed at introducing simple, efficient, low–cost appropriate technology to increase the agricultural productivity, and the cultivated area as well as to promote off-farm activities in the rural areas.

This study was conducted to investigate the environmental and socioeconomic impacts of the intermediate technology which is introduced as a main component of the Nuba Mountains Rural Development Project. To meet the objective of the study a field survey was conducted in the Nuba Mountains area to collect the primary data from a stratified random sample of 296 farmers through personal interviews using a questionnaire. Also complementary qualitative primary data was collected through group discussion and informal interviews with traditional leaders, farmers and agricultural extension agents and observation.

The study findings indicate that, the animal traction implements introduced by the project has achieved considerable positive environmental and socio-economic impacts in the project area. These consequences are reflected in increased cultivated area, increased productivity per feddan, improving farmers' skills and provision of jobs for some marginal groups. Thus, resulted in sustained food security, and increased agricultural income which is reflected in the consumption patterns and significant changes in the beneficiaries' life style, as well as their savings and investment practices.

Introduction:

Animal power is a renewable energy source that is particularly suited to small scale family farming systems and to local transport. Animal power is generally affordable and accessible to the small holder farmers, who are responsible for much of the world's food production. Compared with manual alternatives, the use of animal power allows rural farming households to increase their efficiency and reduce their drudgery. The combination of timeliness and timesaving in field operations promotes the achievement of higher and more reliable crops yield (FAO, 2007). Also, the transport role of animals

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is important for carrying farm inputs (seeds, fertilizers etc…) and outputs (harvested crops). The work animals themselves contribute to food production through milk, meat, manure and offspring. Consequently, throughout the developing world, and in many developed countries, draught animals are inseparable part of agriculture (Agriculture 21, 2007) and in many countries particularly in sub-Saharan Africa the use of work animals for agriculture and rural transport is increasing every year (FAO, 2007).

The Nuba Mountains Rural Development Project (NMRDP) was planned and executed during the period (1979-1995) as an on-farm agricultural demonstration and rural animation project. It aimed at introducing sound animal traction technologies, with associated services in a traditional economy to enable small farmers to increase their agricultural production. This is to be achieved through expanding the cultivated area and improving crop productivity so as to increase farmers' income and improve their living standard. The project also aimed at better utilization of livestock as source of power in the agricultural operations, and other uses.

Despite its many benefits and increasing use in many countries, animal traction technology is seldom included in educational curricula and for the past fifty years, books on farming, whether for school children or agricultural students, have focused on tractor power (FAO, 2007). The result is that most extension agents, researchers, decision-makers and teachers have never studied animal power issues in detail and unfortunately the vicious circle of neglect is increasing over time. This is typically true in Sudan where urban based researchers and planners often ignore the importance of animal power to rural people, as they tackle the issues of modernization, industrialization and urbanization. Thus, the main objective of this study is to contribute to the knowledge and literature in this area by assessing the socio-economic and environmental impacts of the use of animal traction implements (as an intermediate technology) in the NMRD project in South Kordofan State, Western Sudan. The specific objectives of the study are:

1. Assess to what extent the devices introduced are acceptable by traditional farmers in the area.
2. Asses the socio-economic and environmental aspects of animal traction implements (ATIs) in the study area;

Literature review

Studies show that individual tractor ownership is seldom possible for farmers with small areas of cultivation and tractor hire is seldom viable for smallholders particularly in rain-fed food production systems (Agriculture 21, 2007). For such farming systems animal traction may be more appropriate and affordable. Therefore, the use of animal power is expanding and diversifying in many parts of sub-Saharan Africa, Asia and Latin America and even in some countries that are rapidly urbanizing and industrializing (e.g. India, Mexico, Brazil, South Africa) animal power remain important and highly persistent (FAO, 2007). As indicated In Agriculture 21 (2007) the FAO's Agricultural Engineering Branch (AGSE) reported that even in the highly developed European Union, animal power remains important in Spain, Portugal and Greece, where farms are of small size and in the USA, Amish farmers run their farms profitably using only animal power. In Nigeria it has been observed that adoption of animal traction has increased since the mid 1970s following the increase in rural labor wages that is caused by the rural – urban migration of youth and the increase in the enrollment of children in primary education (Phillip and Ogunbile, 1990). Aganga et al. (2000) reported that donkey power

technology has proven to be very relevant to people in the rural areas of Botswana and it is playing an important role in the development of agricultural production. In Ethiopia cow traction technology has been introduced into the farming systems of the Ethiopian highlands since 1980 (Panin and Brokken, 1989).

Animal traction technology continues to make significant contribution to many rural and urban economies (Dijkman et al., 2007). In areas that are difficult for tractors to reach, such as terraced or steep hillsides and on farms where the scale of enterprise, as well as finance, does not justify the purchase of a tractor, animal power is the only means of cultivating the land other than by hand (Pearson and Dijkman, 1994). Animal traction technology assists in eliminating poverty, reducing drudgery and creation of wealth as it can release time that can be used in other productive or socially important tasks and assist directly with crop production (ploughing, planting, and weeding) (FAO, 2007). Food production, distribution and rural trade are also assisted through animal-powered transport as it facilitates the marketing of produce, stimulating local trade and production. Moreover, animal power requires little or no foreign exchange. Thus, while money spent on motors and machinery is exported from rural areas, money invested in animal power circulates within rural areas helping to revitalize rural economies (FAO, 2007). Furthermore, animal power is a renewable energy source that can be sustained in rural areas with little external input. Also, the use of animal power in mixed farming systems encourages crop-livestock integration and sustainable farming practices (Agriculture, 2007). In addition, work animals not only produce their own organic manure, but they provide transport for manure of other livestock to the fields. This enhances the fertility and structure of the soil. Animal power can also be used for a wide range of land management and erosion control systems. Animal drawn levelers can assist with water harvesting or the construction of water ponds and in hilly areas animals can assist with contour ploughing and terracing (FAO, 2007).

The Nuba Mountains Rural Development Project (NMRDP) is considered an important and serious attempt to make use of animal traction technology in rural development in Sudan (Eissa, 1985). It was financed jointly by the European Economic Community (EEC) and the Government of the Sudan, according to Lomme Convention II which governs the cooperation between the EEC and African, and Caribbean countries (Gismalla, 1990). The feasibility studies, selection and test of implements was carried out by the Societe Agricol Technique de Corporation (SATEC), (a French technical consultancy organization). The demonstration activities were carried out in two areas in the Project area (South Kordofan State) with two main types of soil; the clay and the sand loamy soils (South Kordofan State-Sudan, 1996). Emphasis was made on the three main operations (i.e. land preparation, sowing and weeding). Animal drawn implements selected and adopted include; Sine-Grico Hoe, which was later, modified, to suit the Nuba Mountains area and environment, and called the Nuba hoe. It has two types, the heavy and the mini-Nuba hoe. The heavy Nuba hoe has five spring tines and it was designed to be pulled by a camel, a horse, or a pair of oxen. The mini-Nuba hoe has three tines, and designed to be pulled by a donkey, and it is recommended for the sandy soils. Other implements like seeder (i.e. super sam seeder and Ebra planter), groundnuts lifter, and the ridger, were also introduced, as well as animal carts (Ministry of Agriculture and Animal Wealth-Kadugli, 1995).

The Nuba hoe was considered to be the principal implement in the project (Nuba Mountains Rural Development Project, 1992). It is used for multi-purposes, such as land preparation as the main use and then to be fitted to either the ridger or the groundnuts lifter to perform the specific operations of each implement. The seeder is used for all main crops (i.e. sorghum, millet, groundnuts, and sesame). Each crop has a certain seed plate according to the size of the seed. It is suitable for weeding in rows and adapted to all kind of draft animals. The groundnuts lifter is a blade adaptable to the hoe frame to ease groundnuts lifting. The ridger is a blade fitted to the frame of the hoe to make ridges especially in gardud soils (mixture of clay and sandy soils) to reduce water losses through run-off.

The cart is made of steel, having two tires, and of two types; one is pulled by a pair of oxen and the other by a donkey. Its average commercial load is 1000 kg, and 600kg, for the oxen and the donkey type respectively. The animal carts are used for transport of farm inputs; animal traction implements (ATIs), farm products, water and firewood, as well as a mean of transportation between villages. The Nuba Mountains Rural Development Project (NMRDP) was planned and executed to achieve the following objectives (Nuba Mountains Rural Development Project, 1992):

1- To increase crop production in the traditional agricultural sector, through increasing the copped area, improving yield per land unit, and improving the skills and capabilities of the traditional farmers.
2- Make use of animals as source of power to improve the performance of some of the agricultural operations so as to increase the production and reduce rural people, particularly women and children, drudgery.
3- To provide sources of income other than agriculture for the small farmers, so as to improve the standard of living of the rural commuites in the project area.
4- To increase gum Arabic production, and soil conservation, and maintenance by intercropping *Acacia Senegal.*
5- To encourage cooperative movement in the project area.

It is worthmentioning that the project was carried out in two phases. During phase one (1981-1985), the emphasis was on introduction of animal traction technology. During this phase, testing, and selection of ATIs had been achieved, as well as the selection and training of the participant farmers, and their draft animals (Osman, 1989). There was an interim phase (1985-1986), during which phase one was evaluated. Based on phase one evaluation report and some other short term consultancy studies; phase two (1987-1995), had been approved (Nuba Mountains Rural Development Project, 1992). Thus, the project objectives were reformulated to meet community needs in a sustainable manner and to enable the participants to carry on the development activities introduced by the project after its termination. In turn, new programmes, and sub-projects were developed, and introduced (i.e. women development programmes, crop protection, forestry for environmental conservation, and others). The main objectives of phase II of the project included the following ((Nuba Mountains Rural Development Project, 1992):

1- Broaden the project's target groups to include smaller farmers, women, and youth.
2- Introduce modified training and demonstration extension approach, emphasizing group methods.
3- Develop, and promote local animal traction technology.
4- Encourage soil conservation, and sustainable natural resources management.

5- Improve veterinary services in the project's area, and introduce animal husbandry techniques.
6- Establish a viable credit system as a mean for prompting farmer's participation in the project's activities.

Materials and Methods

The study area

As indicated earlier, the NMRDP started in 1979 as an applied on-farm agricultural demonstration and rural animation project in the Nuba Mountains area in Southern Kordofan State, Sudan. The project implementation started in 1980 and it was to deliver its services to the farmers through four nucleus development centers (NDCs): Um-Serdeba and Kadugli NDCs in Kadugli Province, and Sunjukaya and Debkar in Delling Province. The NDCs represent headquarters for development centers (DCs), where the field staff is stationed. There are five DCs in Um-Serdeba, seven in Kadugli, seven in Sunjukaya, and six in Debkar NDC. The NDCs provide agricultural extension, inputs and social services to a number of villages varying in household number and family size.

Due to the civil war in the Nuba Mountains region, the study was restricted only to the areas in Kadugli and Delling Provinces (i.e. the areas within Kadugli and Sunjukaya NDCs). Therefore, the study covered three village clusters (VCs) in each Province. The selected VCs in Kadugli Province are: Saraf-eldi, Dara, and Kwaik. This area is characterized by clay and gardud soils. In the Delling area the selected VCs are: Sunjukaya, Debebat, and Fershaya VC. This area is characterized by sandy soils, with few plots of gardud and clay soils. Selection of these village clusters was intended to represent the different aspects of the physical and social environment in the project accessible area.

Sample selection and data collection:

The farmers in the study area (i.e. the accessible areas within Kadugli and Sunjukaya nucleus development centers) represent the study population. From the project records it is estimated that there are about 1480 farmers who are participating and directly benefiting fro the project in the study area. Unfortunately because of the war conditions and the frequent people movement it was not possible to estimate the number of the farmers not participating in the project. A simple random sample of 148 farmers was selected from the farmers participating in the project. This represents 10% of the total farmers participating in the project. Another group of 148 farmers was selected randomly from the farmers in the same area but not participating in the project. Thus, a total stratified random sample of 296 farmers was selected.

Both quantitative (survey) and qualitative (group discussion) research methods were adopted in this study. Combination of these methods is widely used in contemporary socio-economic assessment research as it allows for collection, analysis and presentation of both quantitative comparative data and qualitative descriptive data (Fals-Borda et al., 1991). Moreover, in addition to primary data secondary data were also collected from the NMRDP documents, published and unpublished theses and research reports, consultancy reports, and other relevant sources.

Quantitative primary data were collected through face to face personal interviews with the selected farmers using a questionnaire that had been carefully designed and tested for validity and reliability. The questionnaire mainly aimed at collecting data related to the

socio-economic and environmental impacts of the animal traction technology in the study area. Thus, the questionnaire consisted of two main parts: the first part addressed the participant farmers' use of animal traction implements and their socio-economic and environmental impacts. The second part of the questionnaire was intended for the non-participant farmers only, with emphasis on their perceptions of the animal traction technology and its impacts.

Group discussion, observation, meetings and informal interviews with traditional leaders, farmers and agricultural extension agents were held to collect qualitative data that will help in interpreting the quantitative data and better understand the socio-economic transformation that resulted from the introduction of the new technology in the area.

The scope of the study required various flexible analytical techniques. Thus the difference of proportion test (Z-test) as well as qualitative description provided during group discussion and informal interviews with key informants are used.

Results and discussion

The study findings indicate that the animal traction technology (ATT) introduced by the NMRDP has generated considerable positive socio-economic and environmental impacts in the project area. These consequences include:

Improvement in the agricultural practices and farming system:

The use of animal drawn implements (i.e. the Nuba hoe, seeder, ridger, groundnut lifter and animal carts), in the project area, has resulted in considerable changes and improvements in the agricultural practices and operations such as:

1. Technological changes and agricultural operations improvement:

Information obtained through group discussion and informal interviews with key informants consistently indicated that before introduction of the animal traction implements in the areas all the agricultural operations used to be performed by manual labor. Since most of the farmers depend on their family labor and were not able to hire labor, dependence of all agricultural operations on manual labor resulted in only small area being cultivated by each family and most of the operations were neither performed properly nor timely. The final outcome was low agricultural production and income. After introduction of the animal traction implements the situation of those who benefited from the project has changed drastically. At the beginning of the rainy season they use the Nuba hoe for land preparations, using thin shares called the "reversible points". It is used to expose weeds from sub-soil, and to minimize water run-off. Two, or three weeks later, when the weeds grow, another set of shares called duck feet (plate x), are used for weeding, and seed bed preparation at the same time. This operation helps in loosening the soil for easy sowing.

On the other hand, seeders are used for planting the different crops instead of hand seeding. This enabled the framers to sow relatively large areas in short time and obtain optimum plant population, optimum plant spacing as the seed drills control the seed rate. The seeders are designed to provide consistent spacing between the rows which is usually 60cm, 90cm, 40cm, and 20-30cm, for dura, millet, seasame, and groundnuts respectively. Another main advantages of the seeders in addition to the sowing at the right time, is that it reduce the need for thinning, a very time consuming operation when done by traditional hand tools, by establishing optimum plant population from the beginning. Also, the optimum plant spacing which resulted from using the seeder facilitates the second weeding operation (locally called the kadeeb), using the Nuba hoe instead of being done

manually. This resulted in timeliness of the second weeding operation. Thus, farmers are able to sow relatively large areas and the sowing and weeding operations (which are very time sensitive agricultural operations) are carried out at the right time.

On the other hand, the Ridger is used to make more control of the scarce water resource (rainfalls), by making appropriate ridges after land preparation to reduce water flooding, and run-off. Thus water remains for longer time. All this has resulted in a substantial increase in the agricultural production and reduction of farmers' drudgery in the area. This is consistent with the animal traction benefits reported in the literature (FAO, 2007; Agriculture 21, 2007).

2. Labor sources and trends:

Despite the fact that farmers participating in the project carried out land preparation, weeding, sowing and groundnuts harvesting by the ATIs, still some agricultural operations such as land clearance, harvesting of dura, millet, and sesame are perform manually. This is consistent with previous research findings which indicated that the use of animal drawn implements usually does not replace family labor, but increases its efficiency, organization, trends and solve labor bottlenecks (Bello, 1994; Chambers, 1993; Adam, 1990; Adaam, 1989; Altierei, 1988; Al-Batthani, 1983). Thus, in this respect the study findings indicated that the use of ATIs resulted in the following:

a. Enabled the implements users to carry out the agricultural operations at their due time. Thus save both time and efforts.
b. Reduced the participant farmers need for family labor compared to the non-participant farmers. While only 30% of the participants' family laborers are involved and participate in the agricultural work, all the non-participants farmers' family laborers participate and are involved in performing the different agricultural operations. This difference between the two groups of farmers regarding their family laborers involvement in agricultural work is statistically very significant ($P< 0.000$) (table 1).
c. Reduced the number of participant farmers who depend on Naffir (reciprocal communal labor) as a source of agricultural labor to only 6% compared to 23% of the non-participant farmers. Again, the difference between the two groups of farmers regarding their dependence on the indigenous cooperation called "Nafir" as a source for agricultural labor is statistically very significant ($P< 0.000$) (table 1).

Moreover, the study results indicated that the ox-cart is getting widely popular in the study area. Its public acceptance has almost completely replaced the traditional means of transportation. Before the project, animals (camels and donkeys) were the means of transportation for the farms movements between different plots, as well as transportation of their agricultural products to home. This used to take ample time and efforts, which could be devoted to agricultural and non-agricultural activities particularly during critical periods such as sowing and harvesting times. In this regard, the study results revealed that 86% of participants own ox-carts compared to 51% of the non-participant farmers. Moreover, information obtained from the group discussion and informal interviews with key informants indicated that the ox-cart represents an important source of income to the owners. The same conclusion was reached by Abusin (1987) and Komey (1994). It is worthmentioning that, ox-carts are

used on rental basis, and in few cases they are borrowed from neighboures or friends. Thus, even some of those who do not have ox-carts also can obtained and benefit fro its services.

3. Economic Impact:

The use of animal drawn implements has resulted in the following economic impacts:

a. The total cultivated area of the participant farmers and non-participants farmers has increased by 128% and 53% respectively; this in turn has resulted in a substantial improvement of their agricultural production and income. The difference in the expansion of the cultivated area between the two groups of farmers is statistically very significant (P< 0.000) (table 1). Some of the non-participant farmers were to expand their cultivated area because they rented some of the animal traction implements, while others were able to do so because their participant relatives and friends allowed them to use their implements free. The group discussion and informal interviews revealed that the substantial increase in the participant farmers agricultural income has affected their consumption patterns, savings to meet future needs and investment (i.e. in livestock, trade and other activities).The researcher field observations confirmed that and it has been observed that there is improvement in the living conditions particularly for the participant farmers. This is mainly due to the improvement of their income and increase of their knowledge and awareness as a result of the extension service and community development activities introduced by the project. Before the project, most of the meager income was expended to get the main basic needs and food items (i.e. sorghum, millet, oil, tea, coffee, soap). Expenditure on goods like clothes, shoes, medicine was very tiny. Change in pattern of consumption is noticed in the people tendency to acquire new clothes, house utensils, buy new bicycles, cassette recorders, radios, and other durable goods.

b. As expressed during the group discussion sessions and informal interviews, the use of ATIs has promoted different types of new off-farm income activities such as sales of livestock, and other trade activities such as handicrafts and renting of ox-cart and other implements.

Table 1. Some socioeconomic impacts of the use of animal traction technology

Socioeconomic impact	Farmers participating in the project	Farmers not participating in the project	Difference (%)	Z-Value
Percentage of family members who work in agriculture	30	All the family (100)	70	7.78*
Percentage of those who depend on Naffir for agricultural labor	6	23	17	4.28*
Owned ox-cart	86	51	35	7.00*
Percentage increase in the cultivated area	128	53	75	11.72*

*** Significant at < 0.000**

4. Social Impact:

The social consequences that resulted from the use of ATIs include the following:

a. The increase of the participants' income had been reflected in improved nutritional status, changes in living conditions, values, and other socio-cultural aspects.

b. Provision of social services (i.e. health and education projects, construction of *Khors* valley bridges, improvement of roads, training of women and blacksmiths…etc)

c. The training approach adopted by the project (at village level), has promoted tribal interaction, cooperation, and cross ethnic acceptance.

d. The use of draft animals (i.e. oxen) as a source of power in agricultural activities, especially among the Nuba, who are sedentary peasants residing in small traditional villages, and usually keep goats and sheep for food and ritual activities, and the Baggara tribe, the traditional cattle breeders, who usually keep cattle for social prestige (Kersany, 1983), is considered a real social transformation in the project area (the Nuba Mountains) where animals are now raised for their economic return and not only as an indicator of the family socioeconomic status. This is considered an important step towards full integration of the livestock in the economy.

5. Environmental Impact:

Soil conservation and natural resources management were considered among the main objectives of the NMRDP. Therefore, and from the early beginning, certain animal traction implements were introduced to improve the soil fertility and conservation, water utilization and vegetative cover especially in the Northern parts of the projects area, which is part of the desertified sandy zone. Thus, the project resulted in several positive environmental impacts which could be summarized in the following:

a. The use of ridger implements for making ridges has minimized water losses through run-off and soil water erosion. This has improved management of rain water, soil conservation, and help in preserving soil fertility.

b. The adopted intercropping farming system, and improved seed, together with the use of seed dressing, resulted in maintaining soil fertility, improved crops yield and fodder production.

c. On the other hand, the expansion of the copped area that resulted from the use of ATIs, has resulted in a direct negative environmental impacts such as shortening the period for which the land is left fallow to regenerate its fertility naturally, reduction of range land, and expansion of agriculture in forest lands.

d. The increased use of forest products and increased energy consumption (i.e. making of charcoal, cutting fuel wood collecting building materials, and such activities) that resulted from the improvement and changes in the living conditions have led to deterioration of forests in the study area, especially in the northern parts, which forms part of the desertified zone.

In this respect it is observed that, ox-carts are used effectively as a source of non-agricultural income (i.e. transportation of forest products from a long distance to be sold in the local markets). However, it is argued that, some of the poor peasants and the landless groups, who represent considerable number of the non-participants sub-community, were not participating in the animal traction programme. That was mainly, because they could not afford obtaining the implements or the draught animal(s).Therefore, they were forced to excessively depend on exploitation of other

environmental resources for commercial purposes to cope with the changing situation (i.e. socio-economic transformation) that is caused by the project.

Conclusion

The study indicated that, while the animal traction implements introduced by the NMRDP have resulted in considerable positive socio-economic impacts, it has resulted in positive as well as negative environmental impacts. The socioeconomic consequences include upgrading of traditional agricultural tools, improving agricultural practices and operations, increasing agricultural production, which resulted in a sustained food security, and increased agricultural income. This is reflected in improvement of the participants' conditions, as well as their savings and investment practices. Thus, the area is witnessing a substantial economic and social transformation. Moreover, the project has resulted in impressive positive environmental impacts such as better management of rain water and reduction of soil water erosion. The adopted intercropping farming system, and improved seeds, as well as the use of seed dressing also have resulted in improvement of soil fertility, increased crops yield and fodder production. The use of farm yard manure also had a significant positive impact on soil fertility and crop production.

On the other hand, the study has also identified some negative environmental consequences that resulted from the use of animal drawn implements in the area. This include removal of forests from some areas for agricultural expansion and shortening of the period that the land is left fallow to regenerate its fertility.

Therefore, the study recommends the use and encouragement of the introduction of animal traction technology as an effective mean for integrated and sustainable rural development and modernization of the traditional agricultural sector in the country. To avoid the negative impact of agricultural expansion on the forests it is recommended that the project should include an afforestation program as one of its important components.

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الآثار الاقتصادية والاجتماعية والبيئية للتقنيه الوسيطة في التنمية الريفية:
مثال من السودان

عبدالرؤوف سليمان بيلو[3] صديق الطيب منير[4]

موجز البحث: انتشر استخدام الآلات الزراعية المسحوبة بالحيوان (كتقنية وسيطه) في العمليات الزراعية (كالحرث, تسوية الارض، الزراعة، الحصاد ودرس المحاصيل) في دول أفريقيا ، آسيا، وأمريكا اللاتينية من قديم الزمان, و تحتلف الآلات المستخدمة من دولة لاخري في انواعها واشكالها واستخداماتها.

تم ادخال الالا الزراعية المسحوبة بالحيوان خلال الحقب الثلاث الاخيره في السودان كأحد مكونات بعض مشاريع التنمية الريفية كبديل للمعدات التقليدية والآلات الحديثة، وذلك بغرض تبني تقانات زراعية رخيصة الثمن، سهلة الاستخدام وملائمة لبيئات وظروف المناطق المختلفه لزيادة الانتاجية، والمساحات المزروعة وتشجيع الانشطة غير الزراعية المدرة للدخل في المناطق الريفية.

اجريت هذه الدراسة للتعرف علي الآثار الاقتصادية والاجتماعية والبيئية للتقنية الوسيطة في التنمية الريفية، في إطار تجربة مشروع جبال النوبة للتنمية الريفية. ولتحقيق أهداف الدراسة تم إجراء مسح ميدانى لجمع معلومات كمية من عينة عشوائية طبقية مكونة من 296 مزارع عن طريق المقابلات الشخصية. كذلك تم جمع معلومات نوعية بإستخدام المقابلات شبه المنظمة مع مقدمي المعلومات الأساسيين في المجتمع، وحلقات النقاش المركزة مع القيادات التقليدية والمزارعين والمرشدين الزراعيين. أثبتت نتائج الدراسة ان الآلات الزراعيه المسحوبة بالحيوان التي ادخلها المشروع حققت اثاراً اقتصادية واجتماعية وبيئية كبيرة في منطقة المشروع. تمثل ذلك فى زيادة المساحات المزروعة وانتاجية الفدان ، تحسين المهارات المحلية , توفير فرص عمل لبعض المجموعات ذات الخصوصية (كالحدادين وغيرهم) بالاضافة الي تحسين مستوى الاستفادة من مياه الأمطار والحد من التعرية المائية للتربة. وقد انعكس كل ذلك فى تحسين مستوى الأمن الغذائى وتحقيق فائض فى الأ نتاج ساهم فى تغيير نمط الأستهلاك في المنطقة خاصة بين المستفيدين من المشروع.

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[4] قسم الارشاد الزراعي والمجتمع الريفي، كلية علوم الأغذية والزراعة، جامعة الملك سعود. ص.ب. 2460، الرياض 11451