Scope for biological sensing technologies in meat production and export in northern Pakistan

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Abstract.

The Khyber Pakhtunkhwa province of Pakistan is rich in livestock resources, including 14.84 million sheep and goats (valued at US$1.60 billion) and a 27% share of the national poultry sector (having an investment of US$2.00 billion), and produces 834 billion kg meat. These huge assets have the potential to support the provincial economy through income generation, self employment and production of certified high-quality food items for the domestic and international Halal Food Market. A model has been developed for analyzing the gaps in the status of health, productivity, nutrition, fertility and management aspects of local farming. Improved practices would be introduced to combat the losses. The model will comprise a farming network linked to farmers’ welfare centre, a central lab and an expert group. A strong sensing technology network would be introduced for data transfer and quality control of the inputs and products. The farmers will e-tag their animals for the purpose of traceability, online history and biodata. The data will be maintained in remote and central servers. A communication system would be developed utilizing mobile phones for the prices, demands and availability status of inputs and produce at local and international markets. A mobile money transfer system will be introduced to exchange, save and borrow small amounts of capital as well as take out short-term insurance policies.

Introduction

Livestock contributed approximately 55.4 percent to the agricultural value added and 11.9 percent to national GDP during 2012-13, against 55.3 percent and 11.9 percent during the same period last year. Gross value addition of the livestock sector at constant cost factor has increased up to Rs.756 billion during 2012-13. Cattle, buffaloes, sheep and goats are major food animals producing 49.5 billion kg milk and 3.4 billion kg meat, with a value of US$ 28.5 billion per annum. The population of the four species of animals showed respective growth of 141, 143, 61 and 269%, with goats recording the highest growth rate, reaching the present population of 58 million heads [1] (Figure 1). A significant share of meat produced in the country is contributed by sheep and goats (19%, Figure 2).

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The export of Halal meat to the Gulf Cooperation Countries has been reported as US$ 2.95 billion. This meat has been produced in the non Muslim regions of Brazil, India, Australia, EU, New Zealand and the USA [2] (Figure 3). Halal International Halal Integrity (IHI) Alliance – Global Halal Authority has been constituted as part of World Halal Forum resolution 2007 and OIC General Assembly 2008. Malaysia approved 45 Halal certification Bodies, Indonesia 40 and GCC countries 52. IHI has been created to serve as a platform for providing services to its members, representing their interests and to liaise with governments, organizations and business communities, including in advising on Halal certification & related matters (www.ihialliance.org). A partnership agreement was signed with Islamic Chamber of Commerce & Industry under the leadership of it’s President, Sheikh Saleh Abdullah Kamel from Saudi Arabia on 12 May 2008.
The Khyber Pakhtunkhwa (KP), the Northern Province of Pakistan with its arid and hilly nature inhabits majority of the small ruminants. These animals are kept by the farmers on small scale under extensive farming system. Sheep and goats, being small-sized ruminants, are capable of integrating into the dissimilar socio-economic situations that is prevailing in Pakistan. Population of sheep and goats in various districts and tribal areas of the province is given in Figure 4. The province has got a great potential for meat export. The federal government of Pakistan is presently executing several projects in livestock sector at national level with an estimated cost of Rs 8.8 billion [1]. These projects focus on promoting milk and meat production/marketing; strengthening of extension services and delivery system to livestock farmers; prevention and control of livestock and poultry diseases; up-gradation of animal quarantine services and provision of veterinary services at farmer’s door step. During the 2009 to 2010 period, technical and financial assistance were provided to farmers, totaling 13,171 fattening operations involving 381,678 animals under the Meat Development Project. Goat has been an important species of these development programs.

MEAT PRODUCTION AND EXPORT POTENTIAL

The total meat produced in the country has been 2.23 billion kg per annum as per latest economic survey [1], comprising 55, 26 and 19% beef, poultry and mutton respectively. This production level has been achieved in spite of the fact that the animals are not provided.
Figure 5. Change in poultry population (million heads) in Pakistan and Thailand; Thailand’s poultry meat export reached 1.75 billion US$ verses nil for Pakistan, FAOSTAT 2013)

Figure 6. Export of meat of various animals from Pakistan during 2010 (total value US$ 93.08 million, FAOSTAT 2013); The huge meat produced by poultry industry was 0.83 billion kg which was ignored.

sufficient feeding, health and marketing inputs, impeding their productivity and profitability. However, the huge potential of the northern areas of Pakistan has got the potential to play their due role in generating self employment for the war hit region and surplus food for earning foreign exchange.

Pakistan has got several goat breeds [3]. Beetal goat is the most popular milk breed, found in the central Punjab, possessing a massive head, Roman nose, long, broad and pendulous ears, well-
developed udder and long teats. Milk yield of Beetal goats has been recorded at 190 L in 150-day lactation period. The goat is fertile with more than 50% twining or triplet births. Male Beetal goats having body weights of 70 to 80 kg are being raised especially for sacrifice on Eid-ul-Azha. Dera Din Panah goat is found in Muzaffargarh and Multan Districts. It has a large head and Roman nose. Milk yield has been recorded at 160 L in 150-day lactation period. Twin births are common in this breed. Hairy goat is a milk breed while Kajli (Pahari) goat is a meat breed of Southern Punjab. Nachi and Pothowari goats are meat breeds of Southern and Teddy is of the Northern Punjab. In the Sindh province, Chappar, Bari, Bugri, Tapri and Desi meat breeds and Jattan, Kamori and Pateri milk breeds are found.

Damani is a dual purpose while Gaddi and Kaghani are meat breeds of the Khyber Pakhtunkhwa province. In Baluchistan, Kurasani goat is a dual purpose breed and Lehri is a meat breed. Goats survive well under the rural environment. They are acclimatized to the diverse agro-climatic conditions and manifest higher fertility and short generation interval, and thus are the animal of farmers’ choice. Because of their low maintenance cost, quick return on capital and low capital investment risk, goats are ideally suited for the poor rural folk especially the marginal and landless laborers. To cut cost of production, goats are usually taken care by engaging family members, especially children and women.

Figure 5 reflect change in poultry population (million heads) in Pakistan and Thailand; Thailand’s poultry meat export reached 1.75 billion US$ verses nil for Pakistan, FAOSTAT 2013). Pakistan performed parallel to Thailand in increasing poultry production; and even exceeded during the last decade; however it could not proceed parallel in respect of making preparations for exporting the produce. As evident from Figure 6 the export of meat of various animals from Pakistan during 2010 [4] (total value US$ 93.08 million) was contributed by cattle, sheep and goats. The huge meat produced by poultry industry was 0.83 billion kg was ignored. The export was materialized by Punjab Meat Company and some private firms.

DAIRY SCIENCE PARK

The International Workshop on Dairy Science Park was held at the Agricultural University Peshawar [5]. The conference was attended by more than 450 delegates from all the four provinces of the country belonging to a variety of segments of the society. Various activities have been proposed for productivity enhancement and industrial applications. Some projects have been identified for implementation at Agricultural University Peshawar. Besides the support already provided to the Faculty of Animal Husbandry and Veterinary Sciences, this University has started dialogues for initiating some additional activities. A liaison has been established with the Khyber Pakhtunkhwa Chamber of Commerce and Industry for supporting commercially viable projects.

The provincial government and other local and international donors are expected to sponsor some viable projects. Goats are being considered as small enterprises targeted at self employment, food security and export to the Halal food market. Local and international investors are being invited to establish partnership with the Dairy Science Park. All the components of the Park would be integrated through a network getting due inputs from the farmers, students, veterinarians, investors, engineers, service providers, inputs suppliers and exporters.
Figure 7. Framework of the use of sensor information in dairy farm management.

Geographic information system (GIS) will be introduced in the region which is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data [6]. It may help in assessing the physical and biological coverage of land and generate information on a combinations of: i) vegetation types/pastures/rotational grazing; ii) soils/degradation/erosion; iii) water bodies; iv) agriculture/at risk of conversion/deforestation and; v) built environments. The shepherds may be provided information on availability and carrying capacity of green masses for grazing of their animals. In the meantime information may be provided to the District Livestock Officers for arranging vaccinations, deforming and making quarantine and marketing armaments for the incoming and outgoing animals from their respective regions. The pasture areas are consistently decreasing in various regions of KP as the water table is going down with the passage of time. This results in decrease in vegetation which leads to further degradation of land. So a vicious circle is constituted where the decrease in vegetation and land degradation support and enhance each other.

E-tagging and animal tracking

Various sensing systems have been introduced like GG02 Mini Solar GPS Tracker, which helps in identification and tracking of the animals. E-tagging has been introduced at livestock farms for the purpose of: i) traceability; ii) online history and; iii) biodata, data transfer for management intervention. The data is maintained in remote and central servers. A
communication has been developed utilizing mobile phones for the prices, demands and availability status at local and international markets for inputs and products.

Environment monitoring

Altimeter/barometer has been used for assessing animal’s physiological requirements comprising assessing stress and economic productivity. Environment meter has been developed for measuring comfortably of animals, ambient temperature, humidity, light intensity and wind speed. The device reported has been m-9100 Lutron Taiwan. Portable CO2 meter has been developed like Model: GCO-2008 for measuring CO (Carbon monoxide) and temperature with a response time of 30 seconds.

Barometer Weather Station have been in use for weather forecasting being sunny or slightly cloudy. Digital barometer 800 mbar to 1050 mbar with an air pressure (mbar or hpa or inhg unit select), operating altitude 300 ~ +1200M; 5), past 12 hour pressure history bar graph and measuring temperature range: -9°C to +70°C

Application of mobile phones have been used due to timeliness of data, accessibility/availability and accuracy of data. The data may be extracted from cell location/GPS, photo/video/sound or barcode reader. The data is user based, is cost effective and is superior to computer due to its portability, easiness an networking. A mobile money transfer systems has been developed for: i) exchange; ii) saving; iii) borrowing small amounts of capital and; iv) short-term insurance policie [7].

Health sensors

Since the 1980s, work has been done on devices that measure a health indicator in, up, on, or from an individual cow [8]. Examples of sensors include milk electrical conductivity, milk color sensors, acceleration sensors (attached to the cows leg and pH sensors. A sensor system consists of the device itself plus the software that processes the data to produce information or advice. Figure 7 has reproduced a framework of the use of sensor information in dairy farm management referred to above. The scheme consists of four levels of activities comprising selection of the activity to be recorded, data interpretation, integration of information and decision making.

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