



Convergence of dynamic extension approaches for promoting bajra napier hybrid among the livestock farmers :a success story in Uttar Pradesh

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ABSTRACT

India ranks first among the world's milk producing nations and among the states, Uttar Pradesh (UP) contributes maximum percentage share (16.5%) in total milk production of India. However, the productivity of livestock in UP is very poor in comparison to Punjab. In the key issues of livestock production, lack of availability of quality green fodder is important for livestock productivity and infertility problems. The fodder production in the country is not sufficient to meet the requirements and the country faces a net deficit of 33.10% green fodder and 11.41% dry crop residues. For improving green fodder availability, ICAR-IVRI has taken up an action research for promoting perennial green fodder Bajra Napier Hybrid (B-N Hybrid) among the livestock farmers. Convergence of dynamic extension approaches like awareness and training, participatory selection of varieties, exposure visit to the demonstration plots, distribution of planting materials, crop establishment and monitoring through participatory mode, recording of farmers feedback as success stories, diffusion of technologies in wider spectrum through ICT modules like Facebook, YouTube, WhatsApp, MobileApp etc. involvement of state extension functionaries, using Public-Private Partnership (PPP) model, interface meeting among the stakeholders made significant impact in adopting B-N Hybrid cultivation in large scale by the farmers. About 615 livestock farmers including mahila kisans were directly benefitted from distribution of planting materials of 6.64 lakh cuttings (Variety CO 4: 2.50 lakh and CO 5: 4.14 lakh) equivalent to the planting area of 22.15 hectares of Uttar Pradesh, Uttarakhand, Delhi, Haryana, Bihar, Jharkhand, Odisha, Rajasthan, Gujarat and Maharashtra. At present, Farmer-to-Farmer extension (FFE) approach is mobilising faster diffusion of this technology within the state of UP and beyond UP.

Keywords: Bajranapier hybrid, extension approaches, fodder

Buffalo is the predominant livestock species in Uttar Pradesh, accounting for 44.6 per cent of total livestock population of the state, followed by cattle (28.5%), goat (23%), sheep (1.97%) and pig (1.94%) as per 19th Livestock Census, 2012 (Anonymous, 2014). Buffalo population in Uttar Pradesh is highest accounting for 28.17 per cent of the total national buffalo population.

Milk production

India ranks first among the world's milk producing nations since 1998 and has the largest bovine population in the World. Milk production in India during the period 1950-51 to 2017-18, has increased from 17 million tonnes to 176.34 million tonnes. The per capita availability of milk in the country which was 130 g day⁻¹ during 1950-51 has increased to 375 g day⁻¹ in 2017-18 as against the world average of 293.7 g day⁻¹ during 2013 (Anonymous, 2018). This represents sustained growth in the availability of milk and milk products for our growing population. Uttar Pradesh (UP), considered as best state in milk production, contributes about 16.5% to the total national milk production per annum (2017-18). Percentage share by UP in total milk production is gradually decreasing with the progress of time. Milk productivity of cattle, buffalo and goat in Uttar Pradesh

is approximately half in comparison to highest state Punjab. The per capita availability of milk in Uttar Pradesh (359 g day⁻¹) is almost equal with national figure (375 g day⁻¹), however, it is three times lower than that of the highest state i.e Punjab (1120 g day⁻¹). Over the last two decades, dairy husbandry has turned out to be the most reliable and primary source of livelihood for rural families living in rain-fed areas. In spite of the importance of livestock, the productivity of our livestock has been extremely poor.

Key issues in livestock production

i) Infertility problem in cow and buffalo. ii) Lack of availability of quality green fodder and area specific mineral mixture. iii) Low success rate in Artificial Insemination (AI) in rural areas. iv) Low level of technical skills, entrepreneurship of the farmers and poor success in crossbreeding programme. v) Lack of preference for goat/sheep husbandry by small holders. vi) Lack of slaughter facilities in the domestic trade especially in rural and remote areas. vii) Inadequate Veterinary Infrastructure and livestock services delivery system. viii) Lack of adequate cold chain facilities for effective vaccination especially in rural areas. ix) Old breeding policy (2002) which needs to be revisited.

Status of fodder production in India

The total area under cultivated fodder is only 8.4 m ha⁻¹ (5.6%) which is static since last two decades. The fodder production in the country is not sufficient to meet the requirements of the growing livestock population and also the forages offered to animal are mostly of poor quality. At present, the country faces a net deficit of 30.65 to 33.10 per cent green fodder, 11.41 to 11.85 per cent dry crop residues and 44 per cent feeds. 54 per cent of the total fodder is met from crop residue, while 18 per cent fodder is met from grasslands and only 28 per cent fodder is met from cultivated fodder crops (Hedge, 2006).

Deficit of feed and fodder availability of desired quality is the major bottleneck restricting growth at desired level. It has been established that the cost of milk production can be significantly lowered by improving feeding system based on green fodder and replacing ingredient of concentrate with leaf meal and enriched complete feed block (Sunil Kumar *et al.*, 2012). It is estimated that, feed alone constitute about 60 to 65 per cent of the total cost of milk production, which can be reduced to 30 to 40 per cent by providing cheap and quality green fodder such as natural and cultivated grasses (Thomas, 2008)

Bajra Napier Hybrid

Bajra Napier is often also referred as B-N Hybrids, King grass, Elephant millet, Cumbu-Napier Hybrids, are tall growing (200-300 cm), erect, stout, deep rooted, perennial hybrid grass. It is the F1 hybrid between Bajra (*Pennisetum glaucum* (L.) R.Br.) and Napier grass (*Pennisetum purpureum* Schum.). The hybrid is a triploid and hence sterile. They spread by short, stout rhizome to form large clumps or stools up to 1 m across and are propagated by two noded stem cuttings or by division of rootstock. B-N Hybrid is one such tropical fodder crop, which can effectively convert solar energy into plant biomass and animal nutrients. Among the grasses, B-N hybrids are the highest green forage yielder in a unit time and space. It is vigorous, nutritious, succulents, palatable and responds to heavy nitrogenous fertilization. Young leafy fodder is highly palatable and possesses a fairly good quality, but mature grass has large portion of stem and hence not considered of good quality. The grass is ideal for feeding as green fodder, silage and hay.

Research findings on Bajra Napier Hybrid

Ridge and furrow method of planting technique of B-N Hybrid with 60-70 cm ridge spacing, 60 cm width of the ridge and 60 cm spacing of plant to plant at the both side of the ridge in diagonal fashion with the varieties CO 4 and CO 5 has been implemented in 37

acres land at the fodder farm of ICAR-IVRI, Izatnagar. Besides, 10 varieties of Bajra Napier Hybrid (CO 4, CO 5, IGFRI 3, IGFRI 6, IGFRI 10, NB 21, NB 37, PhuleJaywant, Yaswhant, Pant Selection 1) and 4 other perennial grasses (Guinea grass/BG 2, Anjan Grass, Hybrid *Setaria* and Marvel grass) are maintained as genetic stock at the cafeteria of perennial fodder crops established at the fodder farm of ICAR-IVRI, Izatnagar. These facilities are being used for demonstration in extension education programme for creating awareness, knowledge and managerial skill of the farmers on B-N Hybrid cultivation. Data, obtained from B-N Hybrid grown in fodder farm of ICAR-IVRI and farmers' field, revealed that among the 10 varieties, CO 5 registered highest crude protein content of 13.1 to 13.5 per cent with the dry matter content of 14 to 16 per cent at the age of 42 to 48 days after cutting. Data also revealed that first cutting of the crop should be taken at 60 days after planting and succeeding cuttings need to be taken within 35 to 40 days interval. Delay in cutting reduced the quality of green fodder and also efficiency of the crop to produced green fodder as tiller mortality was observed in the tasak.

Dynamic extension approaches for promoting Bajra Napier Hybrid cultivation

For improving green fodder availability, ICAR-IVRI has taken up an action research for solving deficiency of green fodder and supporting professional capacities of livestock farmers and rural youth through promotion of B-Napier Hybrid cultivation.

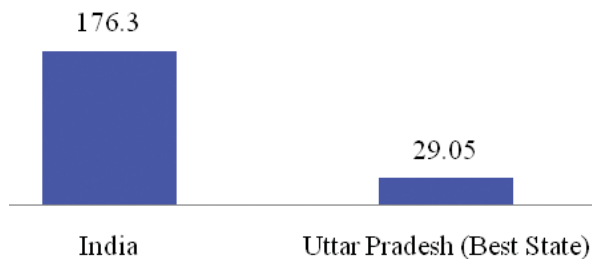
i) Training and demonstration

Adopted livestock farmers of KVK, ICAR-IVRI were selected and empowered about the technology and cultivation practices. Research findings of B-N Hybrid were shared among the adopted farmers and the farmers were exposed to the demonstration plots of fodder farm of ICAR-IVRI, Izatnagar Campus and cafeteria of perennial fodder crops in order to strengthen their awareness. *MohilaKisans* were motivated and empowered about the technology, importance of B-N Hybrid cultivation and finally strengthen with planting materials.

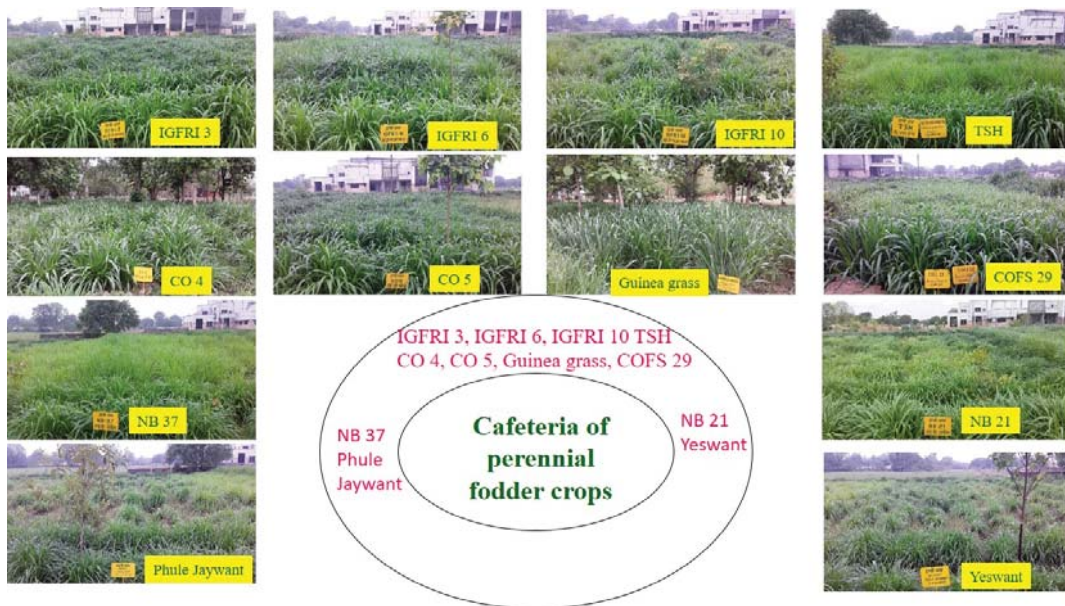
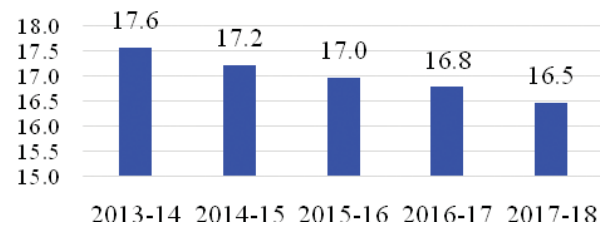
ii) Participatory selection and distribution of planting materials

On the basis of research findings and physical appearance of green fodder in terms of leaf and stem characters, growth, height and nutritional quality, farmers have selected the varieties of B-N Hybrid. The farmers were supported with the planting materials in terms of stem cuttings and rooted slips.

Total milk production (million tonnes)-2017-18



Percentage share by UP in total milk production of India



Farmer-to-Farmer Extension (FFE) Approach

Table 1: Demand and supply of estimate of dry and green forages (million tonnes)

Year	Demand		Supply		Deficit (%)	
	Dry	Green	Dry	Green	Dry	Green
2015	519.7	834.0	460.4	557.9	11.41	33.10
2020	530.5	851.3	467.6	590.4	11.85	30.65
2025	549.3	881.5	483.8	638.9	11.92	27.52
2030	568.1	911.6	500.0	687.4	11.98	24.59

Source: ICAR-IGFRI (Indian Grassland and Fodder Research Institute) -Vision 2050

Table 2: Projected requirement, availability and deficit of CP and TDN (million tonnes)

Year	Requirement		Availability		Deficit (%)	
	CP	TDN	CP	TDN	CP	TDN
2010	60.04	347.8	42.95	271.3	28.47	21.99
2020	62.58	362.5	47.18	290.5	24.60	19.87
2030	67.01	388.2	53.09	320.2	20.78	17.52
2040	70.19	406.6	57.61	342.8	17.92	15.69
2050	74.44	431.2	61.92	364.5	16.81	15.47

Note: CP-Crude Protein TDN-Total Digestible Nutrient

Source: ICAR-IGFRI (Indian Grassland and Fodder Research Institute) -Vision 2050

iii) Crop establishment and monitoring under participatory mode

Crop establishment technique (Ride and furrow method) was executed into the farmers' field through participatory mode and continuous monitoring of the crop was carried out. The important interventions have been made about planting technique, time of irrigation,harvestingand nutrient management.

iv) Recording farmers' feedback

Feedback of the farmers were recorded, which has ultimately led to the development of series of videos in the form of success stories.

iv) Diffusion of technology as success stories

Videos on feedback of the farmers about B-N Hybrid and its educational videos were uploaded on YouTube. A WhatsApp Group of Napier Grass, IVRI was established to link the B-N hybrid growers. The benefits of social media has been harnessed at maximum extent to diffuse the technology.The technology was also diffused through Radio which was recorded and broadcasted by All India Radio Bareilly and All India Radio Rampur of Uttar Pradesh.

v) Entrepreneurial development of rural youth

Rural youth were trained for professional development on B-N Hybrid cultivation for supplying green fodder to the commercial dairy farms and *Goshalas*.

Convergence of dynamic extension approaches

It is worth mentioning here that a specific extension approach as such may not be applicable to all the farming situations. Modification and/or combination of one or more approaches may be more effective. Extension approaches for small, medium and large farms may also vary according to socio-economic factors. In order to fulfil the objective of improving green fodder availability among the livestock farmers the convergence of dynamic extension approaches was adopted through i) involvement of extension functionaries of state line department like state veterinary officers, state livestock extension officers (LEOs), other state extension functionaries (ATM/BTM) of ATMA, ii) utilization of ICT modules through YouTube videos as success stories

- (https://www.youtube.com/watch?v=Ro_HJb2UGGc),
- (<https://www.youtube.com/watch?v=vrW9zsR9Cx8&feature=youtu.be>),
- (<https://www.youtube.com/watch?v=LpZ4IHtfF8I&feature=youtu.be>)

in social media like Facebook, WhatsApp, which has attracted large number of viewers, iii) arranging interface meeting among the B-N Hybrid growers, *Goshalas* and state animal husbandry department for mutual learning, iv) using Public-Private Partnership (PPP) model, v) distribution of farm literature (Folders and Posters) on B-N Hybrid cultivation with the photographs of adopted farmers and vi)finally development of MobileApp on

B-N Hybrid cultivation. All these extension approaches were converged and utilised them together in awareness cum training, technological backstopping, profession development and diffusion of technology.

Outcome of convergence

Convergence of these extension approaches has finally resulted into distribution of 6.85 lakh cuttings of B-N Hybrid (Variety CO4: 2.60 lakh and CO 5: 4.24 lakh) to 615 farmers equivalent to the area of 22.15 hectares area under B-N Hybrid cultivation through distribution of cuttings in the states of Uttar Pradesh, Uttarakhand, Delhi, Haryana, Bihar, Jharkhand, Odisha, Rajasthan, Gujarat, Maharashtra. As availability of green fodder has intimate relationship with milk production, therefore, it was reported by 95 per cent of the total farmers that feeding of B-N Hybrid has increased duration of lactation period and finally total milk yield of milch animals.

At present, this approach is playing a complementary role to formal extension services in facilitating the spread of technology, sharing plating materials and improving farmers' capacities for adopting B-H Hybrid cultivation. The effectiveness and sustainability of this programme is completely dependent on lead farmers as Volunteer Farmer Trainers (VFTs) having sound technical skills of the technology and sharing attitude of information and planting materials. Farmer-to-Farmer extension (FFE) has facilitated diffusion of technology and adoption of B-N Hybrid cultivation up to 0.34 acre, 0.34 to 0.68 acre and 3.7 acres reported by 32.53, 45.78 and 21.68 per cent of the total adopted farmers.

Farmers' overall feedback

B-N Hybrid farmers have shared following important findings during interface meeting among the adopted farmers, officials of state line department, private agencies involved in Public-Private Partnership (PPP).

- i) Bajra Napier Hybrid is a promising perennial fodder crop with high regeneration and tillering ability and it can be grown well in non-competitive land also.
- ii) Cultivation in ridge and furrow method of planting technique reduced water requirement up to 40 per cent.
- iii) Crop establishment was faster in case of planting through rooted slips than that of stem cuttings.
- iv) Farmers has treated B-N hybrid cultivation as one-time investment production system with all-time availability of green fodder as per their requirement except during the harsh winter. Farmers, harvested 6-7 cuttings year⁻¹, obtained 132.0 to 141.0 t green fodder acre⁻¹year⁻¹ with the average productivity of

22.0 to 23.5 t acre⁻¹ cutting⁻¹ (55.0 to 58.8 t ha⁻¹ cutting⁻¹)

- v) Farmers made significant finding that feeding of B-N hybrid as green fodder has increased length of lactation period up to 1 month and total milk yield up to 1.0 litre day⁻¹
- vi) Professional capacities of the farmers and entrepreneurship of the rural youth were strengthened through B-N Hybrid cultivation as average net monthly income (Net returns) was obtained by the farmers to the tune of Rs. 9,717 to Rs. 11,021 from one acre land area.

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