Come and enjoy PAU Farmers’ Fair
Where scientific farming techniques are rare

Kisan Melas

Ludhiana    September 14-15

Nag Kalan Jahangir (Amritsar)   September 5
Gurdaspur                  September 12
Rauni (Patiala)            September 22

Ballowal Saunkhri         September 8
Faridkot                   September 19
Bathinda                   September 27
Dear farmers and farm women,

Here comes the month of September, eagerly awaited by the farmers of the State as Kisan Melas are being organized by PAU across the state during this month. Since their inception in 1967, these melas have proved beneficial for hardworking farmers, farm women, and rural adolescents in Punjab and neighbouring regions. These provide a platform for healthy interaction among farmers and scientists about new skills and technologies. The sale of seeds of improved varieties of rabi crops especially wheat is a major source of attraction in these melas. Huge rush of farmers in Kisan Melas is testimony of faith of farmers in PAU research and extension system over the years. In Kisan Melas, besides field demonstrations, an agro-industrial exhibition is also put up and farm produce competitions are held. This year, in September 2023, Kisan Melas are scheduled to be held on September 05 at Nag Kalan Jahangir (Amritsar), September 08 at Ballowal Saunkhri, September 12 at Gurdaspur, September 14-15 at Ludhiana campus, September 19 at Faridkot, September 22 at Rauni (Patiala) and September 27 at Bathinda. The main objective of Kisan Melas is to give farmers and scientists a forum for constructive dialogue about cutting-edge technologies for improving sustainability and profitability of agriculture. There is a need to make efforts to promote processing and value addition of agriculture produce along with intelligent marketing. PAU has been reorienting and refocusing its research according to the changing agriculture scenario and feedback received from farmers, and always endeavours to upgrade the knowledge of farmers to the latest developments in agriculture.

Farmers along with their families have been participating in the melas with gusto. Hoping that this year also you will grace these melas with your presence and make it a mega success.

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Printed and Published by Dr Tejinder Singh Riar, Additional Director of Communication, for Punjab Agricultural University, Ludhiana and Printed at Foil Printers, Ludhiana
It goes without saying that water is the pivot of life; however, sometimes it can be a source of destruction as well. Recently, the tragedy that befell many parts of our region took a heavy toll on our crop, soil and livestock sources and touched our lives in many other ways. If you leaf through the pages of our interaction with you over the past two-three years through these columns in the Kisan Mela special issues of Progressive Farming, a realization will dawn on you that weather anomalies would tend to occupy a centerstage in our dialogue. We all have been seesawing between extremes: groundwater overdraft (when withdrawal outpaces recharge) is being constantly flagged; heat stress during early 2022 shrank wheat productivity; and now water deluge dealt a blow to farming and other important livelihoods. And every time, we implicate climate change into all these setbacks in a self-accusatory way. Overarching realization is: agriculture is a gamble on weather or climate. Not only during 2022, erratic weather had lurked around wheat crop during February-March 2023 as well.

Initially, we were dreading the repeat of last year’s terminal heat stress. However, rains came in as our saviour. Thereafter, windy weather continued to dread us with flattened wheat landscape. Some of the experts had started giving gloomy forecasts, but market arrivals belied these concerns. Frost had impacted potato and other vegetables adversely during January this year. Also, climate can sometimes be helping someone and ruining the other. Distress sale of capsicum in Punjab was attributed to subdued temperature during maturity phase in Uttar Pradesh; it prolonged the season and thus hijacked a major part of Delhi capsicum market in April from the Punjab.

During the recent floods, paddy being the predominant crop was hit the most. The MSP buffered system made all contingency plans or stopgap measures paddy-centric. Most of the policy interventions involved arranging paddy nursery. Had this disaster taken on us somewhat later, dam reservoirs would not have been of any help to us, and we would have suffered bigger losses owing to already ploughed in capital and loss of replanting opportunity in paddy in some part of the state. We cannot always respond adequately and in time to unpredicted and supersized natural disasters. No doubt, the impact of floods was all-pervasive, considering some media reports on losses suffered by bee-keepers as well, yet it is time that farmers learn to diversify their income portfolio. Processing related occupations need to find a major place in the rural economy, so that weather driven losses in mainstream agriculture can be offset in other occupations.

With regard to much needed crop diversification, research and extension alone cannot bring tangible results. Policy push is an important element in the larger scheme of diversification. The present state government is leaving no stone unturned for making this happen. Unfortunately, anomalous weather has been playing spoilsport off and on here as well. The government machinery worked at full throttle to manage challenges in cotton cultivation and chase the target of 3 lakh hectares. The foremost challenge was non-availability of canal irrigation water at the time of sowing. In order to engage this challenge, the state government mustered its workforce and provided desired financial muscle to bring under use closed water courses. In a short period of about 2.5 months, it opened 13471 water courses (out of 15471 closed, till 2nd July, 2023). The second major impediment taken head on was availability of quality seed. The challenge was identified based on previous season’s yield slide, which was largely attributed to poor quality seed. The state government had provided 33% subsidy to major chunk of farmers. Despite all these good intentions, however, cotton acreage in the state could reach 1.75 lakh hectares only. Aberrant rainfall events interfered with timely cotton sowing. Real force behind loss of interest in cotton cultivation lies in history though, as whitefly epidemic during 2015 had
deal a severe and sustained blow to cotton area in the state. Subsequent setbacks caused mainly by pink bollworm, further shook the confidence of farmers badly. It is hoped that if the current season crop progresses well, we will be able to recover lost acreage and confidence in cotton cultivation. Our field reports reveal that with respect to whitefly, the crop may remain off the danger list. Cotton leaf curl virus incidence also does not seem to present a serious challenge as of now. However, the later stages of pink bollworm are a concern. The farmers should diligently follow recommended spray schedules to ward off the damage.

Staggered paddy transplantation schedule was also implemented religiously under the Subsoil Water Preservation Act of Punjab, 2009. The government also tried to sustain momentum in its efforts for bringing more area under the direct seeded rice (DSR). Though, the desired level of success remained elusive, but data reveal two important niches of DSR in districts Fazilka and Sri Muktsar Sahib. These niches should be in the future policy crosshairs, so that these can be reinforced and appropriately expanded. Special focus can also help in ensuring appropriate area coverage in Basmati rice, as the DSR technique has over the years gotten itself tied to this crop.

Another regular policy focus during Kharif season has been popularization of short duration varieties of rice. Our preliminary surveys showed encouraging trends with respect to the most ideal PR 126 variety. As on 31st July, about 75% area was under short/medium duration varieties against 69% during the previous year and PR 126 topped the list with 33% share. Replanting is likely to nudge PR 126 coverage further. In a proactive way, PAU had advised farmers during the last season to retain seed of PR 126. The university had also made available the seed more than twice the quantity made available ordinarily. At the same time, however, misuse of PR 126 to accommodate third crop spring maize in the cropping sequences is a grim cautionary tale for policy makers. Sooner, we realize that protection of our natural resource base is our shared responsibility better it will be. Highly intensive cropping sequences have encroached upon lean April-May period that has been helpful in natural solarization and hence disinfection of soil. Self seed production and fungicide treatment of the seedlings have also emerged as a key player in managing the foot rot diseases in Basmati crop and growers are advised to work in this direction. Our preliminary surveys had hinted at wider acceptance of PBW 826 variety of wheat due to its yield edge and in this backdrop, we had suggested to store its seed for the coming season.

Significant milestones met with regard to the rehabilitation of canal irrigation in the state should be harnessed for saving groundwater. The jumbo exercise has entailed considerable financial and other resources. Prudent water governance calls for appropriately replacing groundwater with canal water for irrigation purposes to the possible extent.

Paddy crop residue burning is another core issue of Punjab agriculture. The state government and the PAU continue to leverage farm machinery inventory through appropriate support mechanisms and refinements. Farmers need to tap synergies in managing the challenge. The latest addition to our toolkit is the Surface Seeding Technology for planting wheat in combine-harvested paddy fields. Surface seeding can be done manually by broadcasting the seed and fertilizer followed by chopping the paddy stubble with Cutter-cum-Spreader. Alternately, seed and fertilizer dispensing unit has been attached with Cutter-cum-Spreading machine to ease the operation. It is more economical and time-efficient than the existing on-field straw management options. Our field reports confirm that this practice of straw mulching has two additional advantages: better control of Phalaris minor (Gulli Danda) and saving of irrigation water. Another addition to the crop residue management machinery is the tractor operated paddy straw bale shredder-cum- mulcher for mulching in widely spaced (especially vegetables) crops. Waterlogging interferes with wheat crop growth especially after winter rainfall, as it limits oxygen uptake by plants and may impact nutrient, disease, and pest dynamics adversely; under such situations deep ploughing with Chiseler should be undertaken occasionally.

Kisan Melas provide the largest interface between farmers and the scientists. Your feedback matters to us. It helps us to calibrate our research agenda. Technologies resulting from our research work are recommended only when these have been validated at your fields and/or at our regional centres. We acknowledge that with the wisdom of hindsight you are the best judges of our technologies. Since the last Kisan Mela, PAU recommended a number of technologies for field and horticultural crops; food science, nutrition and processing related fields; and for subsidiary occupations. PAU released two special segment varieties of wheat to tap non-MSP premium market and to meet special dietary needs in the family. PBW RS1 has low glycemic acid due to higher share of resistant starch and is thus beneficial for diabetics. PBW Zn 2 followed PBW 1 Zn (released earlier during 2017 as India’s first zinc biofortified wheat variety) in the line of genetic biofortification. PBG 10 is a tall desi chickpea variety, which is amenable to combine harvesting, conferring thereby labour saving, labour safety and timely produce handling advantages. Two cape gooseberry varieties – Banglora and Jabalpur Oblong – have been recommended for cultivation in the state.
Using fish pond sediment fertilizer in maize and paddy @ 6t/acre helps in saving about one-fourth of nitrogenous fertilizer. In case of fields experiencing water stagnation in wheat field around the time of second irrigation, the urea dose (45 kg/acre) can be substituted with foliar application (@ 15 kg/200 litres water) at 42 and 54 days after sowing. For safeguarding efficacy of biofertilizers applied during seed treatment of wheat, biofertilizer consortium should be applied six hours after the pesticide treatment. In case of chickpea, planting of two rows of linseed after every 20 rows of chickpea has been recommended for providing cultural control of pod borer. Stem rot has been a serious issue in berseem crop and has been observed to be aggravated by the use of higher than recommended seed rate. Using seed @ 8kg/acre has been found appropriate in this regard. A drone/UAV (unmanned aerial vehicle) based spray system has been standardized. Kinnow waste (post juice extraction) can be upcycled even at home scale to prepare a bio-enzyme or fermented organic cleanser, which has multiple applications: cleaning of sanitary fittings, washing vegetables and fruits, and waste water treatment.

Freakish weather and frequent natural disasters are becoming new normal for the entire world. There is no denying that blame mainly if not entirely rests with the climate change and so with its perpetrators in the present generation. Climate change and biodiversity loss are deeply interconnected. It is time that we plant trees and take other pragmatic steps towards enhancing biodiversity. This month is suitable for planting of mango, some citrus fruits, litchi, guava, loquat, etc. At the bare minimum, if each one of you takes home back one fruit/aggregate nursery plant, it can make a difference. We at PAU have also renewed our response towards the promotion of biodiversity. Major activities being planned in this regard include refurbishing Botanical Garden and upgradation of Biodiversity Park at Ladhowal seed farm.

We urge that during Kisan Mela you do not throng field crops related technology exhibitions only, but get to dig deep into PAU’s extensive treasure of food science and processing technologies as well. PAU has provided quality handholding to more than 320 agro-processing complexes in the state. Prime need of the hour is to build up a cushion of diversified income sources to offset the impact of weather anomalies on mainstream crop-based agriculture. A range of technologies for millet based bakery and other food products recommended recently by the PAU provide a befitting celebration of the year 2023 as the International Year of Millets. Concerns related to sustainability of natural resources, nutritional and livelihood security demand that small farmers should adopt integrated farming having combination of field and horticultural crops along with the livestock for sustainable household income.

Dear farmers, this year marks Diamond jubilee of the Punjab Agricultural University. This joyous moment does not belong to the PAU only, but to you all as well. May this matchless partnership continue to play a distinctive brand in agricultural development the worldover.
The technological interventions in agriculture to cater the needs of the country facing a serious food scarcity in 1960s acted as a catalyst for paddy cultivation in Punjab. The necessity driven and government supported paddy cultivation in the state not only vanished the diversified cropping system but also exhausted the natural resources at a distressing stage. During the last five decades, from 1970-71 to 2021-22, the paddy-wheat mono-cropping system has completely dominated the state and presently occupied more than 80% cropping area. The area under paddy cultivation increased from 3.90 lac hectares to 31.49 lac hectares and the area under wheat increased from 22.9 lac hectares to 35.26 lac hectares in the same period. This system replaced the diversified crop cultivation of pulses, oil seeds, maize, barley, sugarcane, American and desi cotton etc. In last 5 decades, the area under maize reduced from 5.55 lac hectare to 1.05 lac hectare, pulses declined to 0.62 lac hectare from 4.14 lac hectare and similarly the area under oilseeds reduced to only 0.49 lac hectare from 2.95 lac hectare from 1970-71 to 2020-21. Likewise the area under cotton shrunk to 2.51 lac hectares from 7.58 lac hectares in 1980-81. The area under sugarcane cultivation also declined drastically in the same period. Though the dominanace of rice-wheat cropping system in Punjab ensured the national food security, but at the cost of erosion of natural resources and disturbance of ecological features, pollution and devastation of biodiversity of the state. To fulfill the irrigation requirements of these crops, about 14.76 lac tubewells are continuously extracting under ground water and presently on an average, one tubewell is pumping out ground water from every 2.85 hectare land area in the state. Moreover, for regular supply of power at every corner of the state, a vast power infrastructure has been developed. The deterioration of natural resources especially groundwater, problem of managing agricultural waste, environmental pollution, ecological imbalance and diminishing biodiversity are the major concerns arising out of the existing agricultural system of the state. The issue of paddy straw management has remained much discussed concern since many years as some of the farmers still burn the leftover after the harvesting of paddy. This issue has forced the government and the concerned organization not only to provide infrastructure and develop technology for its management on priority basis but also to educate the farmers and promote the developed technologies for efficient management of paddy straw. Punjab Agricultural University has played a pivotal role in developing the machinery and technologies for management of paddy straw and timely sowing of succeeding wheat.

It is estimated that more than 90 per cent of paddy is harvested by using combine, which leaves the paddy straw and stubbles in the field. Some farmers burn it in the fields which cause loss of essential nutrients and heavy air pollution during the months of October-November. Besides, environment pollution and burning of paddy straw also result in loss of beneficial microorganisms, animals and birds. Many accidents happened on roads due to the smoke created by burning of straw, resulting in huge human lives and financial losses. It has been estimated that burning of one hectare of paddy straw results in loss of 33.0 kg nitrogen, 13.8 kg phosphorus, 150 kg potassium, 9 kg sulphur and 2400 kg of organic carbon. Moreover, to sustain the ecological balance of an area, about 33% area should be under tree cover. However in Punjab it has reduced to about 3.5 % only. Therefore, serious efforts are needed to sustain the biodiversity in the state as this component is highly impacted with existing agricultural system and urbanization and civil developments in the state. The burning of plants and even bigger trees in the fields, along the road sides, water distributries, canals, paths etc. can be witnessed with the burning of paddy straw.

So, dear farmers, Punjab Agricultural University have developed many technologies for the management of paddy straw. In-situ management is one of the best options for utilization of major part of the left over paddy straw in fields by incorporating through use of Happy Seeder, Super SMS, Super Seeder, Smart Seeder, Zero-till-drill, shredders and mulchers etc. The installation of Straw Management System (SMS) with combine harvester is mandatory which
needs to be installed on every combine harvester in the state. It will reduce the burning of paddy straw to great extent. In-situ management of paddy straw proper way helps in reducing air pollution and improves soil health. Straw incorporation in soil also improves physical structure of the soil i.e. bulk density, infiltration rate and water holding capacity of the soil. It also reduces dependence on chemical fertilizers on one hand and prevents soil pollution from agro chemicals on the other hand. Soil micro-flora, also considerably improved with straw incorporation. Paddy straw mulching in different agricultural and horticultural crops is one of the best options as this technology not only suppresses the weeds but also improve the fruit yield and quality in addition to conservation of soil moisture and reduction in input costs. Paddy straw mulching suppresses the weed growth significantly in all field, vegetables and horticultural crops. The collection and utilization of paddy straw for industrial use is helpful for efficient management of paddy straw in Punjab.

The university also recommended the technology of surface seeding in which the sowing of wheat can be done simultaneously with paddy harvesting. The attachment can be fitted with combine harvester to spread the seed and fertilizer in the field followed by chopping of stubbles at 3-4 inch height with cutter-cum-spreaders. If the provision of this attachment is not available then manual spreading of wheat seed and fertilizer uniformly can be done, and cutter-cum-spreaders can be used in similar way. After that irrigation can be applied. In addition, seed-cum-fertilizer drill can be attached with cutter-cum-spreaders for sowing and uniform spreading of straw. This is very effective and economical technology for management of paddy straw and timely sowing of wheat.

Though, there are enormous benefits of in-situ management of paddy straw, but ex-situ management can also be done. Paddy straw can also be used for mushroom production, packing and packaging of agricultural produce. The paddy straw can be used for industrial purposes, biogas production and energy generation.

Dear farmers, the season of paddy harvesting is approaching and it’s my humble request not to burn paddy straw as it is very precious for your fields. It is our moral duty to conserve the biodiversity, reduce pollution and sustain the soil health of our state. Management of paddy straw by using recommended technologies must be disseminated to the fellow farmers by forming the village level committees or groups and through village Panchayats also.

India Biodiversity Awards

In India the Biodiversity Awards is a joint initiative by the National Biodiversity Authority, Ministry of Environment, Forest and Climate Change, and the United Nations Development Programme. In this award the authority identifies and recognize the efforts made by an individual, communities as well as institutions having their efforts in protection of biodiversity, sustainable use of biological resources, access and benefit sharing and biodiversity governance. In India the first biodiversity award was announced in the year 2012 jointly by MoEFCC and UNDP. After the success of first biodiversity award five more awards were held in the years 2014, 2016, 2018, 2021 and 2023. Awards are invited by National Biodiversity Authority through advertisement via publication in newspaper along with news on the website. The biodiversity awards winners will receive a Memento, a Certificate and a cash prize of Rs. 5 lakhs under each category. Two certificates of appreciation will be given in each category with a cash prize of Rs. 1 lakh each. The list of categories given below:

- **Category 1: Conservation and Sustainable Use of Biological Resources**: This award basically relates on efforts made by individuals/institutions/corporate who involved in both management and conservation of biological resources in an equitable and sustainable manner.

- **Category 2: Best Biodiversity Management Committee**: This award mainly recognise the exemplary work of Biodiversity Management Committees in documentation and traditional knowledge through People’s Biodiversity Registers (PBRs) along with generating awareness, establishing best practices in biodiversity conservation, sustainable use, social and gender equity; empowerment and equitable sharing of benefits with the conservers of the resource.

- **Category 3: Incentivizing Access and Benefit Sharing**: This award mainly aims on complete cycle of Access and Benefit Sharing process (ABS) as well as projects augmenting noteworthy monetary and/or non-monetary equitable sharing of benefits out through

**USHA NARA**

*Technology Marketing and IPR Cell*

utilization of biological resources by the concerned communities and stakeholders.

**Category 4: Best Peoples’ Biodiversity Register**: This award deals with the range of traditional as well as innovative methods for documenting by the use of digital technology to maintain the record of Peoples’ Biodiversity Registers and Access and Benefit Sharing (ABS).

**How to apply**: 1. Applications for these awards is available on the website after advertisement. It can be filled and sent to the email id mentioned in the advertisement. The hard copy of the application can also be send on the address given below:

The Secretary, National Biodiversity Authority, 5th Floor, TICEL Bio Park, CSIR Road, Taramani, Chennai -600 113, India, Phone number: Tel: 91-44-2254 1071

2. Hard copies of the application must be submitted in the format as provided in the advertisement any other means will not be considered. For more information you can visit on the website http://nbaindia.org

- **Usha Nara**: 99919-92578
The PAU Kisan Mela is a significant event for agriculture of the state as it brings farmers face to face with new technologies, agronomic practices, new crop varieties, etc. Over the decades, the event has been a valuable tool in providing direction to agriculture and agriculturists from not only Punjab, but also from neighboring states such as Haryana, Rajasthan, Himachal Pradesh. Punjab Agricultural University, Ludhiana has played a key role in increasing food grain production in the Punjab state by developing improved varieties/hybrids and disseminating them from lab to fields. The PAU also serves the farmers by providing quality seed of improved varieties/hybrids of different field and vegetable crops during the Kisan Melas and around the year at Seed Shops and Seed Sale Centres at KVKs, FASCs, RRSs and USFs in various districts of Punjab. Quality seed is the backbone of agriculture as it has high purity, germination capacity and low moisture content, freedom from seed borne diseases and obnoxious weeds that result in the yield improvement. Hence to increase the food grains production for food security, emphasis on the quality of seed has to be made. To maintain the seed quality, various field standards like selection of land, isolation distance, seed rate, removal of volunteer and off-type plants, etc. and seed standards like seed purity, germination, moisture, freedom from weeds and other crop seeds and diseased seeds, etc. as per set standards are being followed during seed production. The seed is properly graded and the samples from the graded seed are submitted to State Government Seed Testing Laboratory for germination and purity testing. If the seed meets the IMSCS, only then it is packed in seed bags and after properly labelling the seed bags, seed is offered for sale to farmers. The seeds of following field crops will be made available at Kisan Melas of the university to be held during September 2023:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Variety</th>
<th>Packing Sizes (Kg)</th>
<th>Sale Rate (Rs/pkt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat (for timely sowing)</td>
<td>PBW 826</td>
<td>20, 40</td>
<td>1,000 and 2,000</td>
</tr>
<tr>
<td></td>
<td>PBW Zn 2</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PBW 824, PBW 803, Sunehri (PBW 766), Unmat PBW 343, PBW 725, PBW 677, PBW 7 Zn, PBW 869, PBW 1 Chapatti</td>
<td>20, 40</td>
<td>750 and 1,500</td>
</tr>
<tr>
<td>Wheat (for 2nd to 4th week of November)</td>
<td>Unnat PBW 550</td>
<td>22.5, 45</td>
<td>800 and 1,600</td>
</tr>
<tr>
<td>Wheat (for late sowing)</td>
<td>PBW 752, PBW 771</td>
<td>20, 40</td>
<td>750 and 1,500</td>
</tr>
<tr>
<td></td>
<td>PBW 757</td>
<td>20, 40</td>
<td>750 and 1,500</td>
</tr>
<tr>
<td>Wheat (rainfed)</td>
<td>PBW 660</td>
<td>20, 40</td>
<td>750 and 1,500</td>
</tr>
<tr>
<td>Barley</td>
<td>PL 807</td>
<td>5, 18</td>
<td>150 and 540</td>
</tr>
<tr>
<td>Gram Desi</td>
<td>PBG 7</td>
<td>2</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>PBG 8</td>
<td>2</td>
<td>240</td>
</tr>
<tr>
<td>Lentil</td>
<td>LL 1373</td>
<td>2</td>
<td>200</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Crop</th>
<th>Variety</th>
<th>Packing Sizes (Kg)</th>
<th>Sale Rate (Rs/pkt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toria</td>
<td>TL 17</td>
<td>0.5, 1</td>
<td>100 and 200</td>
</tr>
<tr>
<td>Raya Sarson</td>
<td>RLC 3, PBR 357, PBR 91</td>
<td>0.5, 1</td>
<td>100 and 200</td>
</tr>
<tr>
<td>Gobhi Sarson</td>
<td>GSC 7</td>
<td>0.4, 1</td>
<td>100, 250</td>
</tr>
<tr>
<td>PGSH 1707 (canola hybrid)</td>
<td>PGSH 1707</td>
<td>0.5, 1</td>
<td>150, 300</td>
</tr>
<tr>
<td>African Sarson</td>
<td>PC 6</td>
<td>0.5, 1</td>
<td>100, 200</td>
</tr>
<tr>
<td>Taramira</td>
<td>TMLC 2</td>
<td>0.5, 1</td>
<td>100, 200</td>
</tr>
<tr>
<td>Linseed</td>
<td>LC 2063</td>
<td>1</td>
<td>150</td>
</tr>
<tr>
<td>Berseem</td>
<td>BL 10, BL 44</td>
<td>2</td>
<td>700</td>
</tr>
<tr>
<td>Oats</td>
<td>OL 13, OL 14</td>
<td>5, 15, 25</td>
<td>300, 900, 1500</td>
</tr>
<tr>
<td>Rye Grass</td>
<td>PBRG 2, PBRG 1</td>
<td>1</td>
<td>300</td>
</tr>
<tr>
<td>Pulses and Oilseed kit (Rabi)</td>
<td>Gram - 0.5 kg, Lentil - 0.25 kg, G. Sarson - 0.25 kg, Linseed - 0.20 kg</td>
<td>1 No.</td>
<td>200</td>
</tr>
<tr>
<td>Rabl fodder seed kit</td>
<td>Berseem - 0.40 kg, Toria - 0.05 kg, Oats - 1.00 kg, Rye Grass - 0.20 kg</td>
<td>1 No.</td>
<td>300</td>
</tr>
</tbody>
</table>
In addition to seed of field crops, winter vegetable kits for kitchen gardening and vegetable seeds in small packets will also be available at Kisan Melas and from seed outlets as detailed below. Vegetable kits are very popular among the farmers and centre of attraction during melas. Winter vegetable kit contains seeds of 10 vegetable crops and can meet the requirement of a family of 5-6 persons.

**Vegetable seed availability**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Variety</th>
<th>Packing size (kg)</th>
<th>Sale price (Rs/ Pkt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell pepper</td>
<td>PSM-1</td>
<td>0.010</td>
<td>200</td>
</tr>
<tr>
<td>Broccoli</td>
<td>Palam Samridhi</td>
<td>0.008</td>
<td>20</td>
</tr>
<tr>
<td>Carrot</td>
<td>PC 161 and PCP 2</td>
<td>0.050, 0.500</td>
<td>50, 500</td>
</tr>
<tr>
<td></td>
<td>Punjab Black Beauty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese cabbage</td>
<td>Saag Sarson</td>
<td>0.033, 0.066</td>
<td>20, 40</td>
</tr>
<tr>
<td>Coriander</td>
<td>Punjab Sugandh</td>
<td>0.050, 0.100, 0.500</td>
<td>20, 40, 200</td>
</tr>
<tr>
<td>Methi</td>
<td>Kasuri Supreme</td>
<td>0.040, 0.100</td>
<td>20, 50</td>
</tr>
<tr>
<td>Onion</td>
<td>PRO-6 and PRO- 7 POH 1</td>
<td>0.100, 0.500</td>
<td>200, 1000</td>
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<td></td>
<td></td>
<td>0.100, 0.500</td>
<td>300, 1500</td>
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<tr>
<td>Palak</td>
<td>Punjab Green</td>
<td>0.080, 0.400</td>
<td>20, 100</td>
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<tr>
<td>Pea</td>
<td>Pb-89, Matar Ageta 7</td>
<td>5, 30</td>
<td>650, 3900</td>
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<td>Radish</td>
<td>Pb Safed Mooli 2</td>
<td>0.066, 0.500</td>
<td>20, 150</td>
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<td>Tomato</td>
<td>Punjab Ratta</td>
<td>0.010, 0.050</td>
<td>50, 250</td>
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<td>L-1</td>
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</tr>
<tr>
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<td>PG 18</td>
<td>2</td>
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</tr>
<tr>
<td>Vegetable Kit</td>
<td>Winter vegetables</td>
<td>1 no.</td>
<td>100</td>
</tr>
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</table>

As the seeds purchased by the farmers during Kisan Melas are to be stored for about 1-2 months before sowing, these have to be protected from the ill effects of the environment like temperature, rain, humidity, storage pests and diseases. The performance of varieties/seeds sold by PAU holds good only when the seeds after purchase are stored under optimum storage conditions and then grown under optimum conditions. Mishandling/negligence of the seed by the farmer/user can result in damage/loss/non-reproducibility of results. Therefore, it is advised to take proper care of the seed after purchase till sowing to avoid any problem of germination. Apart from this, seed should be treated with recommended fungicides and insecticides before sowing to get good and uniform crop stand. To acquire more knowledge regarding successful cultivation of field and vegetable crops, kindly follow the “Package of Practices for Crops of Punjab” being published twice a year and “Package of Practices for Cultivation of Vegetables”.

After the Kisan Melas of the PAU during September 2023, seed of rabi field and vegetable crops will be made available at various seed sale centres located in various districts of the state. The seed sale outlets of the Punjab Agricultural University shall remain open 7 days a week. The contact numbers of various seed sale outlets located in different districts of Punjab are as under:

- **Amritsar**: 98723-54170
- **Muktsar**: 98722-17368
- **Bathinda**: 88722-00121, 94173-68994
- **Mansa**: 88722-00121
- **Ferozepur**: 95018-00488
- **Jalandhar (Nurmahal)**: 99889-01590
- **Jalandhar (Jallowal)**: 81460-88488
- **Faridkot**: 81464-00248, 94171-75970
- **Jalalpur**: 76968-09999, 94633-69063
- **Pathankot**: 98762-95717
- **Roopnagar**: 99882-27872
- **Samrala**: 70534-00034, 98721-66488
- **Sangrur**: 99881-11757, 88721-75800
- **Shambhu Barrier**: 94631-10925
- **Moga**: 98722-18677

- Rajinder Singh: 94649-92257
Skill Development Centre: Assisting capacity building and entrepreneurial skills

RUPINDER KAUR AND PRERNKA KAPILA
Skill Development Centre

The income generating capacity of the members of a society has a direct impact on the development of that society. Agriculture is the main source of income in Punjab. In modern times, agriculture has become mechanized and the work that used to take many days is now done in few hours. For this reason, many people who were earlier engaged in agricultural activities find themselves with a lot of extra time and have no other employment opportunity. But at the same time, there has been a lot of technological advancements and many agro industries have also been established. Because of this advancement, a good solution to solve the unemployment issues and improve the economic conditions of the farmers has also come out. So by establishing small-scale household and agricultural enterprises, we can increase the income of farmers, with which the members of the society can become self-reliant and can play an important role in the development of society.

Skill Development Centre, established at Punjab Agricultural University, Ludhiana is making a valuable contribution for the interest of people of Punjab. Year-round training courses are designed by this centre in such a way that every member of the family can learn and move on the path of progress. The courses start in the month of April, in which the first course is related to education of young children. In this course, the children, their parents and teachers are made aware about the courses available at Punjab Agricultural University and guidance is provided for taking admission in the university after completing classes 10th and 12th, so that they can get enough information to plan about their future. There is a three-month integrated agriculture training course for rural youth who want to take up agriculture as a occupation. This course is conducted twice every year. The first course is from January to March, and the second is from August to October. In addition, the following training courses are organized for farmers and farmwomen:

**Crop Production**

The training program for crop production at the Skill Development Centre aims to equip farmers with the knowledge and skills required to cultivate crops properly and increase farm production. These training courses provide information on new techniques of crop cultivation, pest and disease management, soil fertility, irrigation and other important aspects of crop management. Training is imparted on various research based sowing, transplanting techniques, nursery growing, vegetable cultivation, hybrid seed production, organic farming and cultivation of aromatic and medicinal plants. Training is also given on the cultivation of dragon fruit and other minor fruit crops. It also provides information to farmers on proper use of natural resources and proper use of fertilizers to use best practices and promote sustainable agricultural management.

**Subsidiary Occupations**

The training program on Subsidiary occupations at the Skill Development Centre aims to equip the trainees with the knowledge and skills required to start, manage and grow their own business. The main objective of the program is to provide a comprehensive understanding of various aspects of agriculture based entrepreneurship, including business planning, marketing, financial management, operations and key decision making. Training programs are provided on setting up agro-based industries, starting agro processing units, beekeeping, mushroom cultivation, hydroponics, natural vinegar production, Gur and Shakkar making, flower nursery raising and landscape designing using ornamental plants.

**Training for rural women**

Rural women have an important contribution in agriculture and family system. They contribute significantly in agriculture, animal husbandry management, value addition to farm produce etc. Along with farming, they have directly and indirectly contributed to increasing the family income by maintaining livestock in their homes. They work in various fields like agriculture, animal husbandry, processing of produce etc. and are skilled and knowledgeable in these fields. This is true despite the fact that women are socially marginalized in many areas, have fewer opportunities for education and lack decision-making capacity because they do not have an independent source of income. Therefore, it is necessary to give them technical support so that they can adapt to changing conditions and make proper use of their time and existing abilities to start and sustain an

Contd. on page 23
Transformation from ‘agriculture’ to ‘agribusiness’ has the potential to provide effective solutions to problems faced by modern day agriculture. There is a pertinent need on part of farmers to move beyond mere production activities and find ways to establish market linkages. Agribusiness encompasses diverse activities such as purchase of agri-inputs, production, processing and reaching out to customers with finished products. Nowadays, an agripreneur has to compete with not only fellow producers but also with big companies and Multinational Corporations. Usually a single farmer is devoid of resources and capability to effectively compete in the given scenario. Therefore, the farmers face assiduous task of matching low cost and marketing efforts of big companies. Largely, the above mentioned challenge emanates from lack of scale on part of individual farmers. Lack of scale not only affects the purchase and production efficiency but also undermines the ability to undertake low cost processing, brand building and widespread distribution operations. Therefore, there is an urgent need to aggregate the resources and efforts for operating agribusiness. Aggregated strength of farmers can be instrumental in facilitating the smooth conduct of the business. Concept of Farmer Producer Organization (FPO) has emerged as a promising solution in the given context.

Understanding FPOs

To grasp the basics of FPO, it is important to understand the concept of Producer Organization (PO). A Producer Organisation (PO) is a legal entity formed by primary producers, viz. farmers, milk producers, fishermen, weavers, rural artisans and craftsmen. Producer organization can be created in a number of ways such as a producer company, a cooperative society or any other stipulated legal form. There is also provision for institutions of primary producers to become member of Producer Organization. The FPO is an organization created by farmers as the primary producers. Only primary producers can become members of an FPO. The FPO can be created by primary producers such as farmers, beekeepers, dairy farmers, planters, fish farmers, etc.

Producer Organization is primarily aimed at ensuring better income for the producers through an organization of their own. Small producers do not have the required scale of operations individually (both inputs and produce) to get the benefit of economies of scale. On account of a long chain of intermediaries that connects the producers with the markets, the producers receive only a small part of the value that the ultimate consumer pays. By joining hands, the primary producers can avail the benefit of economies of scale. Economies of scale lead to better bargaining power both on the supply side as well as the demand side.

There are a number of institutions, such as NABARD, SFAC, Government Departments, State Agricultural Universities and Non Government Organizations (NGOs), that support the promotion, incorporation and development of FPOs. As per the available estimates, there were more than seven thousand FPOs operating in India towards the end of financial year 2021-22. Central Sector Scheme (CSS) for Formation and Promotion of 10,000 FPOs has given an impetus to the FPO movement in India. Present focus of the policy makers, on the creation and sustenance of FPOs, throws a plethora of opportunities for the farmers/agripreneurs to join hands and establish direct market connect.

As per the prevailing scenario, different types of FPOs can be formed for pooling the farmers’ efforts. These types vary...
on the basis of legal provisions and the procedure of registration/incorporation. There are various options for registering FPOs. These options are: As Producer Company under The Companies Act 2013; Under Cooperative Society Act; Under Multi State Cooperative Society Act; As Section 8 company under The Companies Act 2013; As a Society under Society Registration Act 1860; and As a Public Trust under Public Trust Act 1882. These options vary in terms of operations, regulations and distribution of dividend among members. Legal forms such as Section 8 Company/Society registered under Society Act 1860/Public Trust under Public Trust Act 1882 do not explicitly provide for profit sharing. However, such producer organizations can benefit the members by offering better price for the produce at the time of purchase. Similarly, these institutions can procure inputs/raw material in bulk and sell to members at lower margin. Such activities are permissible for Producer Organizations under all legal forms. Keeping in view the sustainability and efficiency, Producer Companies can be considered as the most promising of the given options. It is important to compare a Co-operative Society and a Producer Company. Cooperative Societies usually operate with one-dimensional objectives but Producer Companies may attempt to achieve multidimensional business. Cooperative societies work in a limited area of operation but Producer Companies can operate throughout the country. There is no limit on the extent of dividend distribution in case of Producer Companies as the same depends on the scale business. Similar to a Co-operative Society, each member in Producer Company carries single vote. Registrar of Cooperative Societies has the power to veto the decision made by a Cooperative Society. But a Producer Company enjoys full autonomy and its decision cannot be reversed by any outsider. In simple language, a Producer Company is autonomous in terms of operating and expanding its business. A Producer Company is a hybrid between a Private Limited Company and a Cooperative Society. It provides benefits of professional management of a Private Limited Company as well as mutual benefits derived from a Cooperative Society.

Challenges and Impediments

There are a variety of challenges and impediments in the path of ushering in prosperity in rural domain through FPOs. Creation and sustenance issues emerge out of the design errors at the time of FPO creation. These design errors come in variety of forms. Rush to create an FPO for meeting the quantitative targets often compromises the design quality, hence adversely affecting growth and profitability prospects. The FPO mechanism is a participatory and people centric activity. Therefore, incubation time required to organically create an FPO cannot be curtailed by inorganic synthesis. Inability of the relevant stakeholders especially CBBOs (and formerly POPIs) to spread the true spirit of FPO among the potential members compromises the future growth prospects and the majority of the FPOs made in this manner endure only on paper.

Overselling the potential benefits of FPOs also poses a threat to subsequent sustenance. Members normally join with high and unrealistic expectations. Wide gap between the actual benefits and exaggerated promises may dampen the spirit and participation of the members.

Performance of an FPO is a function of the active membership base. Shortcomings in terms of overall membership base coupled with smaller percentage of active members slowly start dampening the pace of FPO activities and associated growth. Irrespective of size, scope and location of a business, the three basic business goals remain universal, i.e., survival, growth and profitability. These three goals are interdependent and cannot exist in isolation. For long term profitability and sustenance, there is a need for ensuring growth of business activities of FPOs.

Concept of FPO is based on the principle of aggregation. This aggregation plays out in form of joint efforts in the domain of purchase, production and marketing. Increased quantum of aggregation provides affirmative effect for growth and profitability. Previously aggregation efforts were undertaken via a variety of organization types such as Self Help Groups and Societies. Such forms largely focused on aggregating the input purchases for achieving cost efficiency for the members. On the input side, such forms were also successful to an extent by garnering the benefits of cost saving through aggregated bulk purchases. At the same time, such forms were not able to leverage the potential benefits through aggregated marketing and sales efforts. The FPOs need to focus on aggregated efforts in approaching the consumer markets. As of now, the scope of enhancing the farmer income through input cost saving is limited as the considerable potential on the front has been realized. On the other hand, there is a considerable scope for enhancing farmer incomes through effective forward linkages. There is an urgent need on part of FPOs to deal with the issue of plugging the leakage of income on account of poor and at times negligible forward linkages. As compared to input side, aggregation of agri outputs remains a tedious task on account of a number of inherent challenges of the process. In spite of these challenges, FPOs remain the best alternative to deal with the situation.

Working concertedly provides a range of benefits from social to psychological. But at the end of the day economic benefits are the primary motive for farmers to join an FPO. For sustained
participation of the members, the basic principles of pooled benefit sharing must be honored. Firstly, the benefits from the membership of FPO must exceed the benefits while operating alone. Secondly, there should be equitable distribution of pooled benefits arising from the joint efforts of FPO.

In the market space, FPOs have to act as business entities and face the market competition. Farmers are the primary producers and lack the business skills required for facing such competition. Current framework for supporting FPOs includes the provision of Chief Executive (the manager) for handling the business side of FPOs. Role of this Chief Executive is to make up for the business skill-based limitations on part of the farmers. For the initial period, funding agencies provide for the salary and training of these executives as part of grant provided to FPOs. Given the fact that Chief Executive is the main player for ensuring the market linkages of FPOs, the selection and long-term association assume critical importance. Improper selection on account of unqualified executives, lack of experience and the tendency of Board members of FPO to favour family/friends often jeopardize an important cog in the wheel of FPO.

Majority of the FPOs face sustainability issues on account of poor business planning and at times there is no business plan in place. Business Plan is a vital document that is designed to pave out the path for FPO progress. A business plan is a written document that describes all the relevant internal and external elements and strategies for starting a new venture. It is an integration of functional plans such as marketing, finance, manufacturing, sales and human resources. At times, FPOs operate sans business plan and hence are directionless. In absence of a sound business plan, FPOs are not able to avail the credit lines from the banks and are not able to scale up. Most of the times Chief Executives hired by FPOs do not have the ability to come up with a sound business plan on account of the inexperience in business planning domain. Stakeholders in form of CBBOs (Cluster Based Business Organization) and POPIs (Producer Organization Promoting Institutions) also lack the capacity on the business planning front and are not able to provide the requisite support to FPOs. There is an urgent need to undertake the capacity building exercises so as to enable the FPOs on business planning front.

Apart from the efforts on part of individual FPOs, institutionalization of support mechanism in various governmental department and banks can be instrumental in building the confidence among FPOs. Such stakeholders should be sensitized to the working of FPOs so that a preferential treatment system is in place. Lack of awareness among the employees of line departments should not be a cause contributing to dampening of FPO spirit. Favourable and preferential treatment to FPOs can be a boost for their business activities and membership growth. As of now, the level and quantum of linkage of FPOs with various government schemes leaves a lot to be desired.

The FPOs offer an excellent opportunity for the farmers/agripreneurs to establish direct market linkages. World of business is full of competitive landscapes. Individually farmers/agripreneurs may not have the required skills and resources to capture the consumer minds and markets. Aggregation of the skills and resources is a potent way for dealing with the competition in the market place and sustaining a profitable business. It is important to note that mere creation/incorporation of an FPO may not translate into the desired objectives aimed at enhancing farmers’ income. Sustenance and profitable growth are equally desirable in the given context. Real measure of FPO movement should be based on their sustainability, profitability, and growth. Mere creation of FPOs does not guarantee success for the FPO mechanism. Timely and germane efforts are urgently needed for addressing the road blocks in the path of FPO success.

- Khusdeep Dharni: 81461-33399
Cultivation of seedless cucumber hybrid in poly-net house

RK DHALL, TS DHILLON AND HIRA SINGH
Department of Vegetable Science

The role of parthenocarpic cucumber hybrids/varieties in increasing the production and productivity of poly-net house grown cucumber is well recognized in the world. Recently, Department of Vegetable Science, PAU, Ludhiana has released a seedless parthenocarpic cucumber hybrid “PKH-11” for cultivation in poly-net house.

PKH-11: It is gynoecious and parthenocarpic hybrid which is suitable for cultivation in poly/net house only. Its plants bear 1-2 fruits per node. Fruits are seedless, bitterness free, moderately ribbed, cylindrical in shape, dark green in colour, 16-18 cm long with average fruit weight of 150-160 g and do not require peeling. It takes 45 and 60 days for first fruit picking after sowing in September and January, respectively. Average total yield is 320 q/acre and 370 q/acre in September and January sown crop, respectively.

Climate

The optimum temperature for germination is 25-29°C. A day temperature of 22-24°C and slightly less at night (19-20°C) is required for growth and development.

Seed rate and seed treatment

For an area of one acre, 12,000-13,000 seedlings are required depending on the bed size, row to row and plant to plant spacing. Treat the seeds with Captan/Thiram/Bavistin @ 0.02 g/10g of seeds before sowing to prevent damping off disease. Treat the seedling in trays with Bavistin (Carbendazim)@ 2.0 g/l before transplanting. If there is problem of whitefly at the seedling stage, then seedlings should be sprayed with confidor (imidachloprid) @ 0.4 ml/l.

Sowing and transplanting time

Cucumber crop can be grown twice in a year under poly-net houses. The first crop of cucumber should be sown in first week of September depending on the temperature and relative humidity. The second crop should be sown in end-December to first week of January and transplanted in first week of February. Transplant the seedlings at the 2-3 true leaf stage which is generally done at 15-30 days after sowing depending on the time of sowing. The September sown crop gets ready for transplanting in 11-12 days after sowing, whereas December-January sown crop takes about 30 days from sowing to transplanting.

Preparation of beds and installation of drip lines

Make the beds 100-110 cm wide from base and 15 cm height, and give slant while preparing the bed (Figure 3). Two rows of cucumber are planted on one bed. Seedlings should be transplanted in a paired row pattern with row to row and plant to plant spacing of 45-50 cm and 30 cm, respectively with zigzag transplanting i.e. in a triangle shape (means plants of second row should be placed in the centre and parallel of the plants of the first row). It is important to choose the space in the poly-house as efficiently as possible, as excessive crowding usually results in small fruits and breakout of leaf diseases.

The drip laterals of 20 mm diameter, 2.0 liters discharge/dripper/hour and 30 cm spacing between two drippers (20:2:30) are laid on beds before transplanting. Two drip lines on each bed are laid and washed before closing them from the ends with the help of end plugs.

Training and pruning

The plants should be trained upwards so that the main stem is allowed to climb to the overhead wire along a polythene twine. All the laterals and fruits should be removed on the main stem upto 25 cm above the ground level. Under optimum conditions, more fruits may initially develop from the axil of each leaf, so fruit may need thinning. Plants allowed to bear too much fruit become exhausted, abort fruit, and fluctuate widely in productivity over time. Weak and unproductive laterals are removed.

Plant Protection

The common diseases of cucumber which occur in the polyhouse are collar rot and wilt caused by Pythium, Fusarium, Rhizoctonia; downy mildew, cucumber mosaic virus and nematodes. Among insect-pests, spider mites, aphids, thrips and white flies can attack cucumbers. Integrated application of amendments, Mustard cake @1t/ha+Neem Cake@1t/ha + Farm Yard Manure@ 2.5t/ha resulted in significant reduction in soil nematode population as well as root gall index as compared to control and yields which were improved.

* RK Dhall: 82838-40078
Practice Seed Plot technique for quality seed potato

AMANDEEP KAUR, SUMAN KUMARI AND HARINDER SINGH
Krishi Vigyan Kendra, Kapurthala

Potato is one of the important vegetable crop of Punjab and is grown over an area of 110.47 thousand ha with the production 3050.04 thousand tones. Productivity of potato in Punjab is quite high in comparison with most of the other states of the country. The state has established itself as a seed producing state in the country and known as potato seed basket for the whole country. Jalandhar and Kapurthala districts of Doaba region contributes about 30% area of potato in Punjab state. Most of the potato produced in this region is supplied as seed to the states of West Bengal, Bihar, Karnataka, Maharashtra, Andhra Pradesh etc.

Use of healthy seed in vegetative propagated crops like potato is very important because seed is a critical input which accounts for about 50% of total cost of production. Continuous use of the same seed without replacement leads to deterioration of quality. Quality seed can be successfully produced in the plains under lower or no aphid population i.e. during October-January and cutting the haulms and harvesting the crop before aphids exceed to damaging/ threshold level. This technique is called Seed Plot Technique and discussed below.

Steps to be followed in Seed Plot Technique of potato

- Select the field which is free from pathogens causing seed borne diseases such as common scab, black scurf and root knot nematodes etc.
- Use healthy virus free seed potato procured from reliable source for sowing. Infected tubers taken from cold store should be buried deep in the soil, it should not be left in the open.
- Seed potatoes obtained from the cold store, cannot be planted immediately. It should be taken out from the cold store 10-15 days before sowing. Dry the tubers with blowers etc.
- Treat the seed tubers with 80 ml Systiva or 83 ml Emesto Prime 22.43 FS or 250 ml Moncoren in 100 litres of water for 10 minutes after taking out of the cold storage to control black scurf.
- Keep the treated tubers in a cool place and shade/diffused sunlight in thin layers for 8-10 days to allow pre-sprouting of seed tubers. This helps in uniform emergence and crop stand, early maturity, more tubers per plant and high proportion of seed sized tubers. The seed crop should be grown in an isolation of minimum of 25 m for foundation seed and 10 m for certified seed.
- Crop should be planted in first fortnight of October and planting should be done at closer spacing of 50 cm x 15 cm to ensure large percentage of seed sized tubers. To plant one acre, 13-18 quintal seed tubers of 40-50 g weight are required. An acre of seed crop will produce seed for planting 8 to 10 acres of crop.
- The aphid which is responsible for transmitting the viral diseases such as potato leaf roll, potato virus X and potato virus Y should be controlled. Spray the crop with 300 ml Metasystox 25 EC in 80-100 litres of water per acre as soon as aphid appears.
- The herbicides recommended for potato crop such as Sencor 70 WP (Metribuzin) 200g/acre should be applied as pre-emergence spray after first irrigation but before the emergence of crop.
- Seed crop should be inspected 3 times after 50, 65 and 80 days during growing season to remove off type and diseased plants.
- First irrigation which should be light one be given immediately after sowing. Subsequent irrigations may be given at an interval of 5-7 and
8-10 days in light and heavy soils, respectively. Restrict irrigation by mid-December i.e. ten to fifteen days before cutting of haulms.

- Crop should be sprayed with Antracol/Indofil M-45/Kavach @ 500-700 g/acre or Copper Oxychloride 50 WP @ 750-1000 g/acre in 250-350 litres of water in first week of November before the appearance of late blight disease followed by 5 more sprays at 7 days’ interval. Under heavy disease risk situation, instead of third and fourth spray of Indofil M-45/ Kavach give two sprays of 700 gm Melody Duo 66.75 WP or Ridomil Gold or Curzate M-8 per acre at 10 days’ interval. Crop should be sprayed with 300 ml Metasystox 25 EC (oxydemeton methyl) in 80-100 litres of water as soon as jassid appears and repeat the spray after 10 days.
- Cut the haulms after 25th of December before the tubers attain more than 50g and the aphid population reaches to a critical level of 20 aphids /100 leaves.
- Harvesting of crop should be done 15-20 days after haulm killing when the fields are in workable condition and tuber skin is hardened. Curing of produce is done by keeping in heaps in a cool and shady place for about 15-20 days.
- Produce should be graded after removing off-type and injured tubers and then filled in disinfected tubers. The bags are sealed, labeled properly mentioning name of cultivar on each bag. Seed potato is kept in cold store up to September to be used in the next season.

The adoption of the above technique will help in producing healthy seed potato and establish a sound potato seed industry in the state.

Kanwarpal Singh Dhillon: 99156-78787
Amandeep Kaur: 98155-76071
**Use pesticides judiciously for production of export compliant basmati**

K S SURI, AMARJIT SINGH AND RUBALJOT KOONER

Department of Entomology

Basmati rice, holds a special status in rice cultivation due to its inimitable natural aroma and distinctive elongation of grains after cooking. In the global market, India is the leading exporter of Basmati rice; the country exported 4.5 million metric tons of Basmati rice during the year 2022-23. In India, the major basmati producing states are Punjab, Haryana, Himachal Pradesh, Delhi, Uttarakhand, parts of western Uttar Pradesh and, Jammu & Kashmir. Punjab has been dominating the basmati rice exports but the rigorous pesticide residue norms adopted by EU and USA, are a cause of apprehension for exports. The pesticide residue norms adopted by Saudi Arabia, Jordan, the UAE, Oman and Egypt are at par with those in the EU. Use of pesticides for managing insect pests and diseases in rice is not a big issue in itself, but its unchecked and indiscriminate use has many hazardous consequences and the detection of pesticide residues in Basmati exceeding the stipulated maximum residue limits (MRLs) is a major concern. Several instances of rejection of consignments have affected our export and forex gains, in the instances of rejection of consignments have been reported. Several attempts have been made to educate farmers on the importance of safe and judicious use of pesticides. However, the demand for producing pesticide residues free, export compliant basmati rice has increased. The EU has set-up standards/MRLs for 22 pesticides, viz. acephate, buprofezin, carbofuran, profenophos, thiamethoxam, chlorpyriphos, methamidophos, carbendazim + benomyl, propiconazole, tricyclazole and thiophanate methyl at 0.01 ppm; triazophos, cyfluthrin, metconazole and prothioconazole at 0.02 ppm; flonicamid at 0.03 ppm; clothianidin and primiphos-methyl at 0.50 ppm; imidacloprid and tebuconazole at 1.50 ppm; tebufenozide at 3.00 ppm; and for isoprothiolane at 6.0 ppm. For the production of export compliant basmati rice, the Punjab government while exercising its power conferred by Sub-section (1) of section 27 of the Insecticides Act, 1968 (Central Act No. 46 of 1968) vide its Notification dated July 26, 2023 has prohibited the sale, stock, distribution and use of 10 pesticides, namely acephate, buprofezin, chlorpyriphos, hexaconazole, profenofos, thiamethoxam, carbendazim, tricyclazole, propiconazole and imidacloprid for a period of 60 days. For production of export-compliant basmati rice, coordinated efforts of all stakeholders are important.

Insect pests and diseases are the major bottlenecks in successful cultivation of Basmati rice. Rice leaf folder, stemborers and rice hispa are the major insect pests while foot rot, rice blast and sheath blight are the major diseases infesting basmati. Farmers use pesticides as the first line of defence for control of these pests, owing to their ease in use, effectiveness and quick knock-down effect, but their indiscriminate use often leads to problem of insecticide residues at harvest. So, only need based application of pesticides based on economic threshold levels (ETL) of insect pests and/or appearance of diseases, should be followed.

The rice leaffolder and stemborers, can be managed when their damage reach the ETL (10% damaged leaves for leaffolder and 2% dead hearts for stemborers) by spraying neem based biopesticide, Ecotonin (azadirachtin 5%) @ 80 ml or Achook/NeemKavach (azadirachtin 0.15%) @ 1 litre or Fame 480 SC (flubendiamide) @ 20 ml or Takumi 20WG (flubendiamide 20%) @ 50 g or Coragen 18.5 SC (chloranlaniliprole) @ 60 ml or Mortar 75 SG (cartap hydrochloride) @ 170 g in 100 litres of water per acre. These insects can also be controlled by applying Ferterra/Marktera 0.4 GR (chloranlaniliprole) @ 4 kg or Padan/Caldan/Kritap/Sanvex/Nidan/ Marktap/Meftap/ Faltap-G/Katsu 4 G (cartap hydrochloride) @ 10 kg or Regent/ Mortel/Mifpro-G/Mahaveer GR/Shinzen 0.3 G (fipronil) @ 6 kg or Vibrant 4 GR (thiocyclam hydrogen oxalate) @ 4 kg per acre in standing water. Use gloves while applying granular insecticides. Rice planthoppers should be managed at ETL (≥ 5 hoppers/Hill) because once the crop is hopper burnt, it is very difficult to spray the dense maturing crop. For its effective management, use Pexalon 10 SC (triflumezopyrim) @ 94 ml or Osheen/Token/Dominant 20 SG (dinotefuran) @ 80 g or Chess 50WG (pymethoxime) @ 120 g or Orchestra 10 SC (benzpyrimoxan) @ 400 ml or Imagine 10 SC (flupyrimdin) @ 300 ml or Ekaful/Quinguard/Quinalmass 25 EC (quinalphos) @ 800 ml in 100 litres of water per acre. Direct the spray towards the base of the plants, where these hoppers are usually present.
Similarly, the diseases like rice blast should be managed with fungicides, Amistar Top 325 SC (Azoxystrobin + difenoconazole) @ 200 ml/acre or Indofil Z-78, 75 WP (zineb) @ 500 g/acre at maximum tillering and ear emergence stages using 200 litres of water. The foot rot disease can be effectively controlled only with the seed and the seedling root dip treatment of Trichoderma harzianum. So, strictly no fungicide should be used at this stage for its control. For sheath blight, Iglare/Pulsor 24 SC (thifluzamide) @ 150 ml/acre or Amistar Top 325 SC @ 200 ml or Follicur/Orius 25 EC (tebuconazole) @ 200 ml/acre or Nativo 75 WG @ 80 g/acre (tebuconazole + trifloxystrobin) or Monceren 250 SC (pencycuron) @ 200 ml/acre can be used efficiently.

The following points should always be taken care of for the production of basmati rice fulfilling the export standards:

- Apply recommended dose of nitrogenous fertilizers, as their excessive usage causes higher insect pest and disease damage
- Regular monitoring of the crop insect pests and diseases
- Follow economic threshold levels (ETL) for using insecticides against insect pests and, other precautionary guidelines, specified for diseases, as per recommendations of the PAU
- Do not use acephate, buprofezin, chlorpyriphos, hexaconazole, profenofos, thiamethoxam, carbendazim, tricyclazole, propiconazole and imidacloprid in Basmati
- Fungicides like Amistar Top 325 SC and Indofil Z-78, 75 WP (zineb) should be avoided at later stages of crop
- Do not use synthetic pyrethroids (like cypermethrin, deltamethrin, etc.) as they often cause resurgence of rice plant hoppers
- Always ensure a ‘pesticide free’ pre-harvest period of 3-4 weeks
- Keep in touch with crop experts from PAU, Krishi Vigyan Kendras (KVKs) and State Department of Agriculture, for the latest updates on quality control and pesticide residue standards
- Keep updated regarding the information on pesticides notified by APEDA and other relevant information published by PAU in newspapers, Progressive Farming and ‘Changi Kheti’

**Taste Buds**

Sweet potatoes, recently labelled as superfood, are enriched with many nutrients. They have the highest amount of β-carotene, an anti-oxidant, which when digested gets converted into vitamin A. They are packed with potassium and are good source of complex carbohydrates. Choline, a micronutrient, is also found in sweet potatoes and required for normal body functioning and human health. As they are highly nutritious, they strengthen the eyesight and immune system, keep skin healthy, good for heart, improve digestion and lower blood pressure. They are easily available everywhere during winters and don’t take much time to cook. One can roast, fry, grill, bake or steam them. Usually sweet potatoes are eaten by boiling and adding black salt and lemon juice over them. Following snacks can also be made using sweet potatoes.

**Sweet potato cutlet**

**Ingredients:** Medium-sized sweet potatoes: 3 (washed, boiled and mashed), Ginger-garlic paste: 1 tsp, Green-chilli paste: ½ tsp, Onion: 1 (finely chopped), Coriander leaves: A few (finely chopped), Semolina/buckwheat flour/gram flour/rice flour: 2-3 table spoon, Salt : Taste, Garam masala : ¼ tsp, Dried mango powder : ½ tsp, Oil : For frying

**Method:** Mix mashed sweet potato with onion, ginger-garlic paste, green-chilli paste and coriander leaves. Then add semolina/buckwheat flour/gram flour/rice flour, salt, garam masala and dried mango powder to make dough. Shape the dough into cutlet, tikka or petties. Shallow fry the cutlets in a pan. Serve with green chutney.

**Sweet potato Kheer**

**Ingredients:** Medium-sized sweet potatoes: 2 no., Milk: 3 cups, Jaggery powder: ¼ cup, Almonds: 10-12 (soaked in water and ground to paste), Cardamom powder: ¼ tsp, Cashew nuts: 7-8 (chopped), Raisins: 10-12, Ghee: 2 tsp

**Method:** Wash and peel sweet potatoes. Grate them. Heat ghee and sauté cashew nuts. Remove and keep aside. Then roast grated sweet potato till it turns light brown in colour. Add milk and cook sweet potato till it softens. Once cooked, add almond paste and cook for few minutes. Add jaggery powder, cardamom powder, cashew nuts and raisins. Cook for two minutes and serve hot/chilled. *Date paste can be used in place of jaggery powder.

**AVNEET KAUR AHUJA AND MANISHA BHATIA**

Krishi Vigyan Kendra, Kapurthala

**Method:** Mix mashed sweet potato with onion, ginger-garlic paste, green-chilli paste and coriander leaves. Then add semolina/buckwheat flour/gram flour/rice flour, salt, garam masala and dried mango powder to make dough. Shape the dough into cutlet, tikka or petties. Shallow fry the cutlets in a pan. Serve with green chutney.

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**Avneet Kaur Ahuja: 97794-71010**
Pea is an important winter season vegetable, which is rich in protein, carbohydrate, vitamin A and C. It is the second important vegetable crop of Punjab and grown on an area of 43.86 thousand hectare with an annual production of 460.45 thousand tons. The major peas growing belts in the state are Hoshiarpur, Patiala, Amritsar and Shaheed Bhagat Singh Nagar. Sowing of early maturing varieties of pea is a profitable proposition because it fetches higher price in market. It requires temperature of 20-25°C for optimum germination. The high temperature conditions prevailing at the time of planting results in build up of wilt and stem fly complex, which further results in unacceptable crop stand and yield losses.

**Early Maturing Varieties**

**Matar Ageta 7**

The plants are vigorous with 15-18 well filled pods having 7-9 grains per pod. The pods are of medium length (9.57 cm), slightly curved from tip and are borne singly or in doubles. Its shelling out turn is 48 percent. It is an early maturing variety which gives first picking in 60-62 days after sowing. Average green pod yield is 32 q/acre.

**AP 3**

Plants are dwarf and straight. The pods are of medium length (8.85 cm), deeply curved near distal end and are borne singly or in doubles. Each pod contains 7-8 grains and shelling out turn is 50%. Seeds are bold, wrinkled with green seed coat. It is an early maturing variety which gives first picking in 65 days after sowing. Average green pod yield is 31.5 q/acre.

**Main Season Variety**

**Punjab 89:** Plants are medium tall, vigorous, having more number of well filled pods (28-30 per plant). The first picking takes place 100 days after sowing. Pods are dark green, 9-10 cm long and borne mostly in doubles. Shelled peas are very sweet and shelling out turn is more than 55 per cent. Average green pod yield is 60 q/acre.

**TIPS FOR CULTIVATION**

**Sowing and Seed Rate:** Since the incidence of wilt in September is very high, somewhat late sowing from first week of October to mid-November gives the best crop in the plains. But in Hoshiarpur, Shaheed Bhagat Singh Nagar and Amritsar districts, it can be sown in last week of September. For mechanized sowing, seed rate is 45 kg for early maturing varieties and 30 kg for main season varieties per acre. Manual sowing can reduce the seed rate. Line x Plant spacing should be 30 x 7.5 cm for early and 30 x 10 cm for main season varieties. The sowing of pea can also be done with Seed-cum-Fertilizer pea drill on ridges which are 60 cm wide. This drill sows two rows of pea which are 25 cm apart on each ridge. This drill can sow one acre per hour.

**Seed treatment for nitrogen fixation:** Treat the seed with Talc based formulation of *Pseudomonas fluorescens* @15 g per kg seed before sowing. In areas where pea crop has not been sown earlier, it is advisable to treat the seed with bacterial culture (*Rhizobium leguminosarum*) to ensure nodule formation and quick growth. It increases the yield and quality of pods. The culture is available in the Department of Microbiology, Punjab Agricultural University, Ludhiana. One acre culture packet of bacterial culture (*Rhizobium leguminosarum*) should be mixed with half litre of water. It is better to add 675 g of *Pseudomonas fluorescens* for 45 kg seed in the same half litre of water while treating with bacterial culture. Rub the mixture thoroughly on seed to give a fine covering of the culture to every seed. Thereafter, spread the seed in shade for drying and plant it immediately afterwards.

**Manures and Fertilizers:** Apply 8 tons of farmyard manure and 20 kg of N (45 kg of urea) and 25 kg of P2O5.
Home Landscaping

PARMINDER SINGH AND RANJIT SINGH
Department of Floriculture and Landscaping

Landscaping is an art by which any site can be improved using the best composition of landscape objects. Landscape objects may be plant material or artificial manmade elements.

As we know, all the arts are inter-related to some extent. Landscape design appears to have closest relationship with the practical aspects of architecture and design. External spaces need to be designed as carefully as interiors as external spaces beautified by using plants and other landscape elements will add to the value of the property.

As the open space in the urban houses is shrinking, the landscape must now be redesigned for dual or multiple use i.e. aesthetic beauty and functional use etc., using all available space on decks below ground and on roofs. Imaginative use of levels, pavings, balcony planting and containerization of plants plays an important role in landscaping of houses.

Selection of plant material may be undertaken keeping in view the availability of open space, requirement (size of the plant) and of course above all, the taste of the family. Home landscaping always starts after the completion of construction work and the site is clear of any contrition material. General principle is that overcrowding with plants must always be avoided, as it creates a sense of confusion in mind. Moreover, planting on sides of house or as edging along with lawn must be simple and only one type of plant that will enhance the beauty, be planted. But nowadays, untrained professionals plant multiple lines of different plants in borders of the lawn and beds. While selecting the plants, flowering time and even leaf texture should be kept in mind to create harmony in the landscaping.

Lawn: Lawn is the life of any home landscape. No landscape is complete without lawn, as it provides the softness and coolness to the house. Lawn making will depend on the open space available and direction of the site. We must carefully select the grass varieties. Nowadays, many types of lawn grasses are available; Selection number 1 is the most suitable for our climatic conditions and is comparatively easy to maintain. The grass roots are dibbled in February-March and July-August. The dense and fine turf of lawn is ready within six months and requires regular maintenance.

Trees: Trees bring the change in skyline because of variation in plant height, foliage colour and flower colour, etc. Trees can be planted according to their use in landscaping. Generally, for home landscaping, dwarf to medium trees like Plumeria spp. (Pagoda), Callistemon lanceolatus (Bottle brush), Lagerstroemia speciosa (Queen flower), and Saraca indica (Sita ashoka) are planted depending on the availability of open space. For narrow landscape, upright but narrow trees like Polyalthia longifolia cv. pendula (Ashoka), Juniperus chinensis, Cupresus sempervirens (Saru), etc. can be planted. A few trees like Putranjeeva roxburghii (Jiva pota), Polyalthia longifolia cv. pendula (Ashoka), Juniperus chinensis, etc. can be planted for screening purpose or making tall hedge. Even a few trees like Ficus benjamina (Golden fig), Ficus panda, Alstonia scholaris (Sat patia), etc. can be trained (size and shape) according to the requirement.

Shrubs: In home landscaping where little space is available, shrubs play an important role. Shrubs can be planted in various locations for different purposes. Shrubs are used to add colour as well as fragrance in the landscape. They can be trained as edge, hedge or topiary (making any shape). Bougainvillea is one such plant which can be used for various purposes i.e. as hedge, as climber, for screening and as flowering pot plant. Shrubs like Muraya paniculata (Kamini), Clerodendron inermi and Duranta species can be used both for edge and hedge making. Shrubs like Ervatamia divaricata (Single chandni), Hamelia patans, Hibiscus rosasinensis (Shoe flower) and Galphimia gracilis are planted for beautiful flowers, whereas Jasminum sambac, Nyctanthus arbortristis (Har shingar) and Cestrum nocturnum are planted for fragrant flowers. Euphorbia metalica and variegated chandni can be planted for creating contrast in landscaping and for foliage beauty.

Climbers: Climbers are used for beautifying pillars, pergolas, arches and trellis, etc. Climbers like Vernonia elegenifolia (Curtain creeper), Bougainvillea, etc. can also be trained as screen along the boundary wall or from roof top. The common climber that are being used in home landscaping are Pyrostegia venusta (Golden shower), Clerodendron splendens, Vernonia Elegnifolia (Jhaller bel), Quisqualis indica (Jhumka bel), Clematis paniculata, Wisteria sinensis, Ficus repens, etc.

Pot plants: Pot plants are also referred to as shade loving plants or indoor plants. There are certain shady places in the house i.e. verandah of house, corridors of building, north side of the building and underneath trees, where such plants can be accommodated. These are mainly used for interior decoration.
and different types of pot plants are available to suit different locations. For sunny locations, plants with variegated foliage and flowering pot plants can be planted. Moreover they are also suitable for multistory buildings. The important ones are Crotons, Syngoniums, Monstera, Money plant, Asparagus spp., Ficus panda, Ficus benjamina, Ferns, Aglaonema, Diffenbachia and Phyllodendrons, etc. They come in various colour and hues which can be intelligently used for home landscaping.

**Ground covers:** They play an important role in improving the landscaping of the shady sites or the houses facing north or where it is difficult to grow grass. They are helpful in suppressing the weeds. They are permanent in nature and require less labour. In any modern landscape design, they must occupy significant portion of the plant material used.

**Vertical garden:** Nowadays, vertical garden is also in trend. They are designed in shady areas or in sunny areas by using special pots which are fixed in the walls by using special frames. They are to be irrigated by drip irrigation system. The careful selection of plants for these gardens is very important for this purpose. The plants should be of trailing types instead of upright growth habit. For shady north sides, we can use foliage plants like, money plants, artillery plant, callisia, chlorophyllum, etc., while for sunny situations, flowering plants like kalanchoe, nasturtium, etc., should be selected. Selected plants should have drooping growth habit to match the requirement of vertical gardens. Beautiful contrasts can be made by using foliage colors of the plants.

**Hardscape:** In home landscape, hardscape structures like tiles, stones, garden lanterns, solar lights, and pergola, gazeboes, etc. can also be planned depending on the available space by consulting the landscape experts.

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**Tips for successful cultivation of pea……from page 19**

(155 kg of Superphosphate) per acre before sowing.

**Weed control:** The field should be kept free from weeds by giving two hoeings after four and eight weeks of germination, respectively. For chemical weed control, use Stomp 30 EC (pendimethalin) @1.0 litre per acre or Afalon 50 WP (linuron) @500 g per acre as pre-emergence i.e. within two days of sowing. Dissolve the herbicide in 150-200 litres of water and spray uniformly over the entire field.

**Irrigation:** It is very important to sow the seed in proper soil moisture condition when it is sown flat and first irrigation should be given when the seeds get germinated. When it has to be sown on ridges, then irrigation can be applied immediately after sowing. Next irrigation should be given at flowering and then at fruit set, if necessary. Pea can be grown as rainfed crop with limited irrigations. The total number of irrigations required are 3-4 depending on the soil type and weather conditions.

**Harvesting:** The pods are harvested at edible maturity stage and do not allow the pods to over mature which impairs its quality. Two pickings from the early varieties and 3 to 4 pickings from main season varieties are obtained. The pods of Mithi Phali variety are generally harvested at 2-4 days interval; otherwise the pods became overfilled with seeds.

**PLANT PROTECTION MEASURES**

**Insect-Pests**

**Pea stem fly:** It sometimes causes serious damage at seedling stage to early sown crop. To control it, apply 10 kg Furadan 3G (carbofuran) granules per acre in furrows at the time of sowing.

**Pea thrip:** It causes severe damage to the young crop by sucking the cell sap.

**Pea-leaf miner:** Its larvae feed by making tunnels in the leaves. These cause serious damage during December-March. Its control is same as that of pea thrip.

**Pea aphid:** It sucks the cell sap, owing to which the leaves turn pale and dry. Its control is same as that of pea thrip.

**Diseases**

**Pea Wilt:** This disease generally comes on the early sown crop and is caused by fungus, Fusarium oxysporum f.sp. pisi. Soil temperature ranging from 23 to 27 °C is most favourable for the development of disease. As prevention avoid early sowing of pea in badly infested areas. Treat the seed with Talc based formulation of Pseudomonas fluorescens @ 15 g per kg seed before sowing.

**Powdery mildew:** Powdery mildew generally comes late (mid February-March) under Punjab conditions when the crop is near maturity; therefore economical losses are very less. In early maturing varieties, there is no problem of powdery mildew. Spray the crop with Sulfex @600g in 200 litres of water per acre. Three sprays may be given at 10 days interval.

**Rust:** This disease is more serious on late sown crop and generally comes in December- January. Give first spray of 400 g of Indofil M-45 in 200 litres of water by the end of December. Three subsequent sprays may be given at 10 days interval. For controlling powdery mildew and rust together, Karathane @ 80 ml or Sulphex @ 600 g can be sprayed in combination with Indofil M-45 @400g per acre.

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* Parminder Singh: 97795-81523

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* RK Dhall: 82838-40078
Tips for successful cultivation of autumn sugarcane

PARMINDER SINGH SANDHU AND NAVJOT SINGH BRAR
Farm Advisory Service Center, Tarn Taran

Area under paddy cultivation in Punjab is more than 31 lac hectare and due to continuous paddy- wheat cropping system many problems are being faced by farmers. This cropping system continuously has caused environmental degradation and underground water level is falling year after year. So it’s high time to shift on other cropping systems and maintain the ecological balance of our environment. Yield under rice- wheat cropping system is stagnated and farmers need to adopt other options for earning more profit. Cultivation of autumn sugarcane with intercropping of other rabi crops is another option with farmers to earn more profit. Majority of farmers are growing spring sugarcane but cultivation of autumn sugarcane after kharif crop is good option with farmers to earn high profit instead of paddy- wheat cropping system. In this article we are highlighting the tips for successful cultivation of autumn sugarcane.

i) Varieties recommended for planting autumn sugarcane in Punjab: CoPb 92, Co118, CoJ 85 and CoJ 64.

ii) Planting time: 20 September to 20 October.

iii) Seed Rate: 30-35 qt/ acre.

iv) Selection of seed: The seed for autumn planting should be obtained from a well grown spring or autumn crop and use only the top two-third portion of the selected canes for planting.

v) Seed Treatment: To improve the germination, soak the sett in water for 24 hours before planting.

vi) Use of insecticides and pesticides in soil: To protect the crop from termite attack apply 200 ml Coragen 18.5 SC (chlorantraniliprole) using 400 litres of water over seed setts in furrows before covering them with soil or spray 45 ml Imidagold 17.8 SL (imidacloprid) in 400 litres of water with sprinkler along the rows at post germination stage (about 45 days after planting).

vii) Method of Planting and Spacing: Plant the sugarcane after preparing field with ridger in rows 90 cm apart.

viii) Fertilizers: Apply 2 quintal urea in three equal doses, 1/3 dose of N should be applied at planting, 1/3 at the end of March and the remaining 1/3 by the end of April. Apply phosphorous and potash on soil test basis. The fertilizer recommendations for intercrops are given in Table 1.

ix) Chemical weed control in autumn sugarcane: When wheat is intercropped in autumn sugarcane apply 400 ml Axial 5 EC (pinoxaden) or 13 g per acre Leader/SF-10/ Safal/ Marksulfo 75 WG (sulfosulfuron + metsulfuron) or 160 g per acre Atlantis 3.6 WDG (mesosulfuron + iodosulfuron) using 150 litres of water per acre at 30–35 days after sowing wheat.

x) Irrigation: Apply first irrigation one month after planting, followed by three irrigations upto February.

xi) Prevention of lodging: Prop up the crop using the trash-twist method which consists of the tying of a single cane row instead of tying two rows together. Twist the leaves and the trash to make a rope and pass it alternately along the cane clumps in the row. This method does not hinder the growth and photosynthesis of the plants as in the case when two cane rows are tied together.

xii) Frost damage protection: Poor and stunted crop suffers more from frost damage as compared to healthy crop therefore raise a bumper crop with adequate fertilization, irrigation and plant protection measures. Also, lodged crop is more damaged by frost therefore prevent lodging. Moreover, irrigate the crop, as adequate soil-moisture during the frosty period keeps the soil comparatively warm and saves it from frost.
In autumn sugarcane farmers can grow wheat, raya, gobhi sarson, agrican sarson, toria, gram, potato, cabbage, radish, tomato, garlic, onion, shimla mirch, broccoli, cauliflower etc crops from mid-December to mid March to end May according to their date of sowing and can earn some extra income.

**Importance of ratoon management in improving the yield:**

- Always harvest the crop to be ratooned by the end of January as if the crop is harvested earlier than there will be poor sprouting of the stubbles due to low temperature during December and January.
- Soon after the harvesting of early varieties in November or December, remove the trash and irrigate the field. When the soil attains the optimum moisture conditions, loosen it by hoeing, ploughing or interculture.
- Harvest the canes as close to the ground as possible to promote better sprouting. If still some big stubbles are left, shave or lop them off close to the ground. Also remove late tillers or water-shoots, as they inhibit full sprouting of the stubbles.
- Plough the harvested field twice with a tractor-drawn tiller to check weeds or adopt chemical weed-control measures.
- The stand of the ratoon crop can be improved by planting the gaps with three budded setts in the beginning of March.
- Nitrogen requirement of the ratoon crop is one and a half-times than that of the plant crop. Apply 90 kg N (195 kg urea) per acre to the ratoon crop in three split doses one third in February-March, one-third in April and the remaining one-third in the beginning of June. Drill phosphorus along the cane rows in March on the basis of a soil test.

* Parminder Singh Sandhu: 98882-99130

**Skill Development Centre ..........Contd from page 10**

enterprise. This will not only provide financial support for the family but will also help rural women make better decisions. To achieve this objective, training is imparted in entrepreneurship development in preservation of seasonal fruits and vegetables through pickling, making chutneys and marmalade, making products from cereals, pulses and millets, soybean and milk processing, bakery, confectionery and handicraft designing.

The schedule of programs can be obtained from the website www.pau.edu. Interested candidates can register online through the link provided on the website. The duration of these courses ranges from One day to three months. The training fee is also reasonable. Arrangements are also made for the accommodation of farmers/farm women who come from distant areas. Certificates are awarded for courses of five days or more duration. During these training courses, apart from subject knowledge, information about packaging, labelling and marketing of products and linkages with banks are provided so that trainees can start their own enterprise or set up Self Help Groups.

At the Skill development Centre, special training courses on mushroom cultivation, preservation of fruits and vegetables, making cakes, biscuits and sweets, bee-keeping, horticulture and use of agricultural implements are conducted free of cost for the persons belonging to Scheduled Castes. The accommodation and refreshment of the trainees are arranged by the Skill Development Centre. Apart from all these courses, some 200 hours/240 hours courses are conducted for skill development with the support of Indian Council of Agricultural Research. These courses are approved by Agriculture Skill Council of India and Punjab Skill Development Mission and are free for the learners i.e. no fee is charged. These courses are as follows:-Mushroom Grower, Quality Seed Grower, Pack House Worker, Bee-Keeper, Organic Grower, Gardener, Floriculturist, Group Farming Practitioner etc.

The Punjab Agri Business Incubator (PABI) program is running under the National Development Plan at the Skill Development Center and has given two months training to 149 entrepreneurial farmers in four batches under schemes 'Uddam' and 'Udaan'. After the training, the business plans of these trainees are presented to the Ministry of Agriculture. Selected trainees of “Uddam” may get a grant of Rs. five lakhs and selected trainees of “Udaan” may get a grant of Rs. Twenty five lakhs with the help of which they can start business on a large scale and the youth of Punjab can get new business opportunities. So far, a total of 57 agri-startups have received financial assistance ranging from Rs. 5 lakhs to 25 lakhs in 4 batches. Such projects are going on at the Skill Development Centre and the farmers of Punjab can be benefited by taking advantage of these projects.

Besides training courses, various clubs/associations are being run for farmers, farm-women and youths like PAU Kisan Club, Progressive Bee-Keepers Association, Tree-Growers Club, Soya Processors Club, Organic Farming Club, Flower Growers Club, Crop Residue Managers Association, Mushroom Growers Club and Aromatic and Spice Growers Association. Monthly or quarterly training camps are organized for the members of these clubs.

Apart from these activities, educational visits of farmers and students of Punjab and other states are also conducted by Skill Development Centre. These visits pave the way to spreading awareness about the opportunities available for the benefit of farmers.

* Rupinder Kaur: 97797-00905
**Cultivate toria for additional income and crop diversification**

**Amit Salaria, Gobinder Singh and Harinder Singh**

Krishty Vigyan Kendra, Kapurthala

**Toria** is an early maturing oilseed crop of North India. It is generally considered to have low potential yield and much attention is not given to toria crop, but actually this is not true. Viewed in terms of seed yield per unit area per unit time, the toria crop is as efficient as raya and gobhi sarson. Being shorter in duration, it can be easily sown before the harvest of kharif and sowing of rabi crops. Toria can be raised after summer moong, sunflower, spring maize and groundnut, kharif fodder, vegetables and in the fields left fallow during rainy season. Thus, it fits well in multiple cropping systems, hence providing opportunity for crop diversification besides generating additional income. Toria can also be sown as intercrop with autumn cane and gobhi sarson crops. In addition, it has also potential to be marketed and consumed as saag around the city areas as crop is early in maturity as compare to gobhi sarson. The tips for successful cultivation of toria are given below:

Prefer well drained loamy soils for the cultivation of toria crop. Prepare fine seed bed with two to four ploughings operations followed by planking after every ploughing. Sow the crop in a fairly moist seedbed for good germination, but too moist seed bed impacts its germination.

Choose recommended varieties for general cultivation in Punjab. The details of toria varieties recommended by PAU, Ludhiana are given below:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Maturity time (days)</th>
<th>Seed yield (q/ha)</th>
<th>Oil content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TL-17</td>
<td>90</td>
<td>5.2</td>
<td>42</td>
</tr>
<tr>
<td>TL-15</td>
<td>88</td>
<td>4.5</td>
<td>41</td>
</tr>
</tbody>
</table>

Sow the toria crop early in September. In case of toria and gobhi sarson intercropping, both these crops should be sown simultaneously in third week of September. When toria is intercropped with sugarcane, it should be sown from 20th September to end-September.

About 1.5 kg seed is sufficient for sowing one acre of toria crop. The seed is sown with a drill or pora attached to a plough at row to row spacing of 30 cm and sowing depth of 4-5 cm. Manually operated oilseed drill can also be used for sowing the crop. It ensures uniform placement of seeds at a desired depth and row spacing is maintained with the help of markers provided in the machine.

Thinning of toria crop should be done three weeks after sowing to maintain plant to plant distance of 10 -15 cm.

To get higher oilseed productivity, toria and gobhi sarson can be sown simultaneously in third week of September in alternate rows 22.5 cm apart or sowing toria by broadcast and gobhi sarson in lines 45 cm apart, using one kg seed per acre for each crop. The toria crop will be harvested around mid-December, while gobhi sarson will continue in the field till end of March. Average yield of 12 quintal per acre can be obtained from both these crops.

Likewise, two rows of toria (at spacing of 30 cm) can be successfully intercropped in between the autumn sugarcane lines during 20th September to end-September. The seed rate of 1 kg per acre is sufficient for toria to be intercropped in autumn sugarcane crop.

Apply 55 kg urea and 50 kg single super phosphate per acre to sole toria crop and drill the fertilizers at sowing. Prefer phosphorus from single superphosphate as it contains sulphur along with phosphorus. When toria and gobhi sarson crop are sown together in third week of September, drill 55 kg urea and 75 kg single superphosphate per acre at sowing. Apply 65 kg urea with irrigation after harvesting of toria crop. In case of toria intercropping in autumn cane, apply 33 kg urea and 32 kg single super phosphate per acre in addition to the recommended fertilizer dose of sugarcane.

Weeds can be controlled by giving one hoeing to toria three weeks after sowing preferably with improved wheel hand hoe.

Preferably, one irrigation should be given at the time of flower initiation.

Harvesting of toria crop is done when siliqueae turn yellow. The harvested crop should be stacked at the threshing floor for 7-10 days before threshing. After threshing, seeds are separated from the husk with the help of slow moving natural air current. The crop produce should be marketed after proper drying.
Farmers need to be vigilant about quality of silage

MANOJ SHARMA AND SK SANDHU
Directorate of Extension Education

Punjab state, currently representing 13th largest dairy market in India, is expected to grow at a CAGR of around 15% during 2021-2026. Presently, animal husbandry holds a key role in the state economy and has emerged as a profitable venture after crop farming with second largest contributor (33.4%) to the agricultural GVA (Punjab Economic Survey 2020-21). Punjab produces 6.7 per cent of India’s total milk and has per capita availability of 1,181 g of milk per day, the highest in the country (national average of 406 g per day) with more than 3.5 lakh farmers associated to dairy sector. Increasing the productivity of animals and decreasing the cost of production are key to dairy farmers making profits. The growth of dairy farming, which was flourishing till 2016, is marred by high input costs, resulting in decline in profits and lack of mechanization.

Under agriculture diversification programme, State government is prioritising to make Punjab as the ‘Milk State’ by improving dairy farming as a viable alternative. To overcome one of the major constraints i.e., the lack of quality feed and fodder to the dairy animals especially during lean months, farmers are showing a large interest in processed fodders. Silage from maize, known as “Makke Da Achaar” is one of the acceptable easy options and gaining popularity among the dairy farmers of the state.

In Punjab, there are five large scale and about 60 small scale silage units which mainly use spring/summer maize with about 20-25% kharif maize for silage production. Besides silage units, many farmers, mostly in Hoshiarpur, Ropar, Morinda and Mohali, make silage at their own level by digging pit.

As the silage use is gaining popularity, there is utmost need by farmers to be aware of the silage quality and the consequences to animal health if proper norms to ensure good silage are not followed. The quality of silage is a real concern for the farmers. The rising incidences of ensiling of maize stalks without cobs; early or late-cutting of maize; heavy infestation of molds, mixing, etc. raised lack of trust among farmers.

Grains constitute an important component for silage and the crop should be harvested only when grains at ½ to 1/3 milk line stage for silage making. For quality silage making, fermentation process should be conducted in an anaerobic environment, where the starch gets converted to acids. The acidic environment kills most of the microorganisms and preserves the fodder. The dry matter and water soluble sugar content of the crop are major determinants of the buffering capacity. Ideally, at the time of ensiling, dry matter content of fodder should be 30-35% and water soluble sugar content 2-3% (fresh basis) with buffering capacity of <300 mEq/kg DM. Early crop at beginning of milky stage will result in low dry matter. Similarly, late harvesting, when grain is near maturity, can cause a low nutritive value of silage as after dough stage, starch and fiber digestibility get reduced leading to low palatability. In addition, the other field practices like chop length, airtight covering of pit, sealing, management during storage and feed out, etc. are important parameters which should be well considered.

The sensory traits like colour and smell of prepared silage can be assessed by farmers to ensure good quality silage. The colour of good quality silage for maize, cereals and other grass silage is light green to green. If colour of silage is very dark to dark olive, it indicates silage with limited fermentation, whereas brown to dark brown indicates aerobic spoilage due to improper compaction. Farmers can easily detect white molds or fungus infestation which indicates improper anaerobic conditions and spoilage in silage, and should not be fed to animals. Good silage should be free from molds, yeasts, clostridial bacteria and any other unwanted organism. The aroma of good quality silage should be mild, pleasantly acidic with sour milk or natural yogurt smell. Strong vinegar smell indicates poor fermentation. Chemical testing for quality of silage should also be done. Good quality silage be acidic with pH value 3.8-4.2, lactic acid >4%, acetate acid 1-3% and butyric acid <0.13% on 2-3% on fresh basis. The ammonical nitrogen is the best indicator of silage fermentation and to ensure, it should be less than 10% total nitrogen. The easy access of chemical testing facilities to farmers at reasonable process will ensure the production of quality silage.

Amongst upstream agro industries, the silage industry, where maize serves as an important raw material, can not only bridge the gap of demand and supply as a replacement for green fodder but has a huge potential to revive the household dairy by reducing the feeding cost and increasing the farmer income in a sustainable manner provided farmers restrain using water guzzling summer maize (after wheat harvest) and remain vigilant about quality of silage.

• Manoj Sharma: 98727-45890
Make hay in easier way - Conserve fodder in bright sunny day

HARPREET KAUR OBEROI, MANINDER KAUR AND R S SOHU
Department of Plant Breeding and Genetics

Low milk productivity of the animals is ascribed chiefly due to inadequate supply of nutrients. The cheaper and easily available sources of nutrients to lactating animals are green fodder which is abundantly available in our farmer’s field. But the major problem in our dairy farming is that the supply of green fodder is not regular for the whole year. So, we have to develop different techniques in our dairy units to ensure that the nutrient product is available around the clock. Successful animal production requires an adequate supply of nutrients throughout the year. Forage can be profitably preserved either as silage or hay for providing nutrients during scarcity. Punjab’s farmers have shown great interest in reaping good benefits from silage making recently. Particularly, during the spring season, a large area was sown under maize for further processing it into silage. No doubt, silage making has given the farmers huge profits but the environmental consequences of raising the maize crop for silage is also grave, especially, in terms of requirement of large amounts of water which further contributes towards the Punjab’s depleting ground water level. In contrast, hay making can conserve the abundant supply of green fodder especially from legume crop without serious degradation of the environmental resources particularly underground water. Hence, a regular supply of the nutritious product in the way of hay can be ensured throughout the year. Feeding hay to livestock also helps reduce the amount of concentrate feeding and thereby, the cost of feeding. This article attempts to provide detail information with regard to the process of hay making as well characteristics of good hay which can be of high use to the forage growers in Punjab.

HAY: Hay refers to forage that are harvested and dried and stored as 85-90 per cent dry matter. Hay is a leafy dry fodder, green in color and free from moulds. It should contain less than 15 per cent moisture. The principle of hay making is to preserved nutritional value of forages through drying it to a level of 10-12 per cent optimum moisture content at which the activity of microbial decomposers is inhibited. Forage can be harvested at the stage of proper nutritive value and be preserved as hay for feeding it during lean period.

Leguminous kharif fodder crop: Crops with thin stems and more leaves are better suited for hay making as they dry faster than those with thick stem and small leaves. Kharif fodder crop cowpea can be preserved as hay and it is as nutritious as the green fodder and its helps in increasing milk production during period of fodder scarcity. Legume crop such as cowpea is very good for making hay. In addition to mineral and vitamins in dried legume fodder crops, protein is rich in quantity, which is why it is important to dry the fodder used in ration. There is a special way to cut and store different fodder crops. Hay is made only from leguminous crops which are very rich in protein and minerals.

The nutritive value of fodders – hay (on dry matter basis)

<table>
<thead>
<tr>
<th>Leguminous crop</th>
<th>Crude Protein (CP) (%)</th>
<th>Total digestible nutrients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpea</td>
<td>22.5</td>
<td>61.2</td>
</tr>
</tbody>
</table>

Method of Hay Making: The fodder
Crops for making hay should not be harvested immediately after irrigation. They should rather be harvested in the afternoon in bright sunny day and before applying irrigation, so that they have less moisture and more of dry matter. A simple method of making hay is described below. It can be easily adopted by the farmers without extra investment in equipment.

- Cut cowpea at the pre-flowering stage in order to ensure it has maximum nutrients and green matter.
- Chop the forage while still moist (fresh or wilted) with a chaff-cutter.
- Chopping need not be too fine. The best length of the cut is about 5 to 8 cm.
- The cut forage cowpea is laid out in the sun on smooth hard surface in as thin a layer as possible not exceeding 12 to 15 cm in height, and raked a few times i.e. every 2-3 hours during the day and turned regularly to hasten drying. The usual threshing floors, roof tops, polythene sheet etc. can be used for drying of forages.
- Do not leave cut cowpea to dry in a moist environment, as this will encourage the growth of moulds which can be harmful to livestock and to people handling it.
- The drying process may take between 2 to 3 days. Hay should not be over dried as it may start to ferment and also become a fire hazard.
- The dried hay should ideally be stored in form of bales when the moisture content is low, ideally less than 15%. This helps storage, requires less space and facilitates the transport to the market.
- The chopped and dried forage can be stored at the farm in the same way as wheat bhusa is done in thatched or mud-covered stacks or in buildings normally used for storing wheat bhusa or rice straw.

Factors affecting hay quality: The quality of the hay is directly related to the stage of the growth of the fodder species, the leaf-stem ratio, color and storage.

Stages of maturity at harvest: Younger the plant better in quality. As plant mature, their lignin content (a component of fibre) increases and traps nutrients within indigestible cell walls. Cowpea, leguminous fodder crop, should be harvested at the flower initiation stage. At this stage, the crop has maximum nutrients and green matter.

Leaf stem ratio: Leafiness is an excellent indicator of hay quality. This refers to the ratio of leaves to stems present and is also related to the stage of maturity. Leafiness in cowpea is particularly critical because being a legume fodder crop it loses their leaves during curing and handling more readily than grasses. Leaves contain more amount of carbohydrate, protein vitamin and minerals than the other part of plant. Hence, to preserve leafiness, hay must be cut early and carefully cured and handled.

Color: Color can be definitive characteristics of hay. The desirable hay color is the bright green. Green hay is rich in carotene, whereas straw colored or brown hay is poor in carotene. Avoiding rain damage is a goal in haymaking. Brown hay indicates heating from microbial (mold) growth and fermentation. This results when the hay is stored at too high moisture content. This hay has a distinctive musty, mouldy, odour. Moulds consume nutrients in the hay, particularly sugars and starches and producing carbon dioxide and water.

Storage: It should preferably be stored at a low temperature and humidity so as to prevent losses owing to the oxidation of the carbohydrates. The losses may be as high as 40-50 per cent if not stored properly.

Quality of leguminous hay:
- Hay should be nutritious, therefore, prepared from plants cut at an appropriate stage of maturity when it has the maximum when it has the maximum nutrients.
- Good hay should be leafy. The leaves are generally richer in proteins, minerals and vitamins then other plant of the plant.
- Hay should be green in color. The green color indicates the amount of carotene which is precursor of vitamin A.
- Hay should be soft and pliable.
- Hay should be free from weeds and stubbles.
- The moisture content in hay shouldn’t exceed 15 per cent.
- It should have the smell of and aroma of characteristics of the crop from which it is made.

Hay making advantages:
- It can be kept for longer periods of time with little loss of nutrients if protected from weather.
- It can be produced and fed in small or large amounts.
- It can be harvested, stored and fed by hand. It reduces the labour involved in handling and transport of green forage.
- Hay can supply most nutrients needed by many classes of livestock.

Harpreet Kaur Oberoi: 99880-32271
Like crops, the requirement of trees for various essential nutrients should be fulfilled, so that the plant growth is not adversely affected due to deficiency of nutrients. In this way, the full production potential of tree species can be utilized.

A constant and balanced supply of all the essential nutritional elements is required for normal plant growth and development. Any imbalance in the supply of essential nutrients leads to emergence of nutritional disorders. Several soil factors such as soil texture, pH, organic matter, calcium carbonate and type of clay minerals, etc. determine the availability of nutrients in soil. In addition, nutrients are present in soil in various forms that differ in their availability to plants. The nutrient elements essential for plant growth can be divided into two categories. The nutrients that are required in higher quantities are called as macronutrients and these are Carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg) and Sulphur (S). The nutrients which are required in lower quantities but are as much important for plants as macronutrients are called as micronutrients. These are Zinc (Zn), Iron (Fe), Manganese (Mn), Copper (Cu), Molybdenum (Mo), Chlorine (Cl), Boron (B) and Nickel (Ni). Deficiencies of micronutrients, mainly Zn, Fe and Mn have been reported in the state in various crops grown in the soils with coarse texture, high pH, high CaCO3 and low organic carbon content. Zinc now is being considered as the third most important element for crops after N and P. The deficiency of Zn has been reported in almost all the districts of the state. The deficiency of any essential nutrient adversely affects the yield of crops as well as the quality of produce.

Poplar, Eucalyptus and Dek are the three most important fast growing short rotation tree species which are preferably grown by Punjab farmers as compared to slow growing species. Such fast growing tree species require higher amount of nutrients for their normal growth as they produce higher quantity of biomass in a short period. Therefore, these species deplete the soil more than the slow growing tree species. If these species are planted in agroforestry system i.e. in combination with agriculture crops, these can also meet some of their nutrient requirements from fertilizers applied to crops (especially N, P and K which are generally applied to crops). The coarse textured soils already deficient in organic matter and nutrients are prone to nutrient deficiencies in these species. Sometimes, the availability of a nutrient element in the soils is reduced to such an extent that plants show specific symptoms of deficiency of that particular element. In Punjab, the deficiency of Zn in Poplar and that of Fe in Eucalyptus plantations and nurseries has been observed. Generally, the growth of plants has already been adversely affected by the time the deficiency symptoms appear and corrective measures taken at that time may not produce the desired results. Nevertheless, for a farmer, the appearance of deficiency symptoms is the first sign when one can visually judge that the growth of plants is being limited due to deficiency of a nutrient. Thus, it is very important to have knowledge about the nature of these deficiency symptoms so that timely corrective measures can be applied to prevent the growth of tree species from being hampered.

**Fertilizers for Poplar**

In agroforestry systems, better tree height and girth of poplar can be obtained with the application of N as depicted in Table 1. Every year, apply 1/3rd N during May after harvesting of the *rabi* intercrop, 1/3rd N in July and the remaining 1/3rd N in September. These doses are for the soils which are medium in available N. In high N soils, apply 25% less fertilizer and in low N soils, apply 25% more than these doses. There is no need of P application to poplar every year, because the plants can fulfill their P requirement from the P applied to wheat or other crop in winters which is released during favorable weather in the summers.

**Table 1: Recommended fertilizers for poplar plantation**

<table>
<thead>
<tr>
<th>Growth year</th>
<th>Nitrogen (g/plant)</th>
<th>Urea (g/plant)</th>
<th>Area of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
<td>170</td>
<td>1 m diameter ring</td>
</tr>
<tr>
<td>2</td>
<td>120</td>
<td>260</td>
<td>2 m diameter ring</td>
</tr>
<tr>
<td>3</td>
<td>160</td>
<td>350</td>
<td>3 m wide strip (1.5 m on both sides of tree row)</td>
</tr>
<tr>
<td>4</td>
<td>200</td>
<td>430</td>
<td>- do -</td>
</tr>
<tr>
<td>5</td>
<td>240</td>
<td>520</td>
<td>- do -</td>
</tr>
<tr>
<td>6</td>
<td>280</td>
<td>610</td>
<td>- do -</td>
</tr>
</tbody>
</table>

**Zinc deficiency in Poplar:** In poplar,
the deficiency symptoms of Zn firstly appear on the recently matured leaves in plantations as well as in nurseries (Plate 1). First of all, the symptoms appear on 5th or 6th leaf from top of stem or branches of plants. The deficiency is exhibited by development of irregular interveinal chlorosis of leaves along the margins which extends towards base of leaves. The mid rib and the veins remain unaffected for a longer time in comparison to yellow tissue in between the veins. In case of severe deficiency, the veins also start turning yellow. The affected leaves become stunted, rough and their size do not increase. The deficiency affects the growth of plants and the internodal length of branches does not increase.

**Corrective measures:** In poplar nurseries, apply 40 kg zinc sulphate heptahydrate (21% Zn) or 25 kg zinc sulphate monohydrate (33% Zn) per acre in Zn-deficient soils at the planting time of nursery. Repeat the dose after 2 years.

In poplar plantations, apply 100, 200 and 300 g/plant zinc sulphate heptahydrate (21% Zn) in Zn-deficient soils during 1st, 3rd and 5th year of growth, respectively. Mix the fertilizer with upper 15 cm soil and apply irrigation to increase the effectiveness of fertilizer.

**Fertilizers for Eucalyptus**

For getting better productivity from eucalyptus plantations, proper nutrition schedule to the plantations should be followed (Table 2). During 1st and 2nd year – apply in 1 m diameter ring around the tree. During 3rd to 6th year – apply in 2 m diameter ring around the tree. Every year, apply whole of DAP/SSP, MOP and 1/3rd urea in April, 1/3rd urea in July and the remaining 1/3rd in October. Muriate of Potash should be applied only if soil test shows deficiency of potassium.

**Iron deficiency in Eucalyptus**

Iron deficiency first of all appears on younger and new leaves. Firstly, there is interveinal chlorosis of the younger or new leaves (Plate 2). Thereafter, the veins turn yellow and ultimately whole leaf turns yellow. The deficiency also extends towards the older leaves on the branches and all the leaves turn yellow. Under severe deficiency, the affected leaves are bleached and they give a whitish and bleached appearance.

**Corrective measures:** Four to five sprays of 0.50% (500 g FeSO₄.7 H₂O in 100 litres water) can be done to ameliorate the Fe deficiency in Eucalyptus plantations. Deficiency of Fe can also be corrected by application of 50 g/plant Fe-EDTA to first year plantations, 100 g/plant Fe-EDTA to second and third year plantations, and 200 g/plant Fe-EDTA to fourth and fifth year plantations of eucalyptus.

**Fertilizers for Dek**

In an agroforestry system, the tree height and girth of dek were the highest with the application of N as given in Table 3. Apply 1/3rd N during May after harvesting of intercrop, 1/3rd N in July and the remaining 1/3rd N in September. These doses are for the soils which are medium in available N. In high N soils, apply 25% less fertilizer and in low N soils, apply 25% more than the above doses. There is no need of P application to dek every year.

**Table 3: Recommended fertilizers for Dek plantation**

<table>
<thead>
<tr>
<th>Growth year</th>
<th>Nitrogen (g/plant)</th>
<th>Urea (g/plant)</th>
<th>Area of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>130</td>
<td>1 m diameter circle</td>
</tr>
<tr>
<td>2</td>
<td>90</td>
<td>195</td>
<td>2 m diameter circle</td>
</tr>
<tr>
<td>3</td>
<td>120</td>
<td>260</td>
<td>3 m wide strip (1.5 m on both sides of tree row)</td>
</tr>
<tr>
<td>4</td>
<td>150</td>
<td>325</td>
<td>- do -</td>
</tr>
<tr>
<td>5</td>
<td>180</td>
<td>390</td>
<td>- do -</td>
</tr>
<tr>
<td>6</td>
<td>210</td>
<td>455</td>
<td>- do -</td>
</tr>
</tbody>
</table>

At last, it can be concluded that like crops, the requirement of trees for various essential nutrients should be fulfilled, so that the plant growth is not adversely affected due to deficiency of nutrients. In this way, the full production potential of tree species can be utilized.

*Baljit Singh: 81465-00629*
**SUGARCANE**

1. Complete the planting of sugarcane upto October 20. Intercropping of wheat, raya, toria, gobi sarson, pea, gram, potato, cabbage, radish, garlic, etc. can be done successfully in this crop.

**WHEAT**

1. Start sowing wheat varieties, namely, PBW 826, PBW 824, PBW 766, DBW 187, HD 3226, PBW 725, PBW 677, HD 3086 WH 1105, Unnat PBW 343, PBW 1 Chapati, PBW 1 Zn; and durum wheat WHD 943 and PDW 291 in entire state under irrigated conditions. Wheat varieties DBW 222 and HD 2967 can also be sown in the entire state except sub-mountainous districts. In fields where paddy straw has been managed with Happy Seeder and Super Seeder, sow wheat variety PBW 869 in the entire state. Start sowing of variety PBW 660 under rainfed conditions from the last week of October.

2. In medium fertility soils, apply 55 kg of DAP/acre at sowing to irrigated wheat as a source of nitrogen and phosphorus. If 155 kg of single super phosphate is applied as a source of phosphorus, then apply 20 kg of urea just before pre sowing irrigation or with the preparatory tillage. In potassium deficient soils, apply 20 kg Muriate of Potash/acre along with the preparatory tillage. In fields where paddy straw has been managed with Happy Seeder and Super Seeder, sow wheat variety PBW 869 in the entire state. Start sowing of variety PBW 660 under rainfed conditions from the last week of October.

3. For judicious use of nitrogen fertilizer, use PAU LCC as described below:
   - Drill 55 kg of di-ammonium phosphate (DAP) per acre at sowing in medium fertility soils. Apply 40 kg of urea per acre for timely sown and 25 kg of urea per acre for late sown (after mid-December) wheat with first irrigation.
   - Match leaf colour of the topmost fully exposed intact leaf from the randomly selected ten plants with LCC under shade of your body before second irrigation (about 50-55 days after sowing). Apply urea based on leaf greenness of majority of leaves as per following table:

<table>
<thead>
<tr>
<th>PAU-LCC reading</th>
<th>More than LCC 5</th>
<th>LCC 4.5 to LCC 5</th>
<th>LCC 4 to 4.5</th>
<th>Less than LCC 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea dose (kg/acre)</td>
<td>15</td>
<td>30</td>
<td>40</td>
<td>55</td>
</tr>
</tbody>
</table>

**Note:** The leaves selected for matching colour with LCC should be free from disease/insect incidence and other nutrient deficiencies.

In rainfed areas, apply 35 kg of urea, 100 kg of single superphosphate and 20 kg Muriate of Potash/acre at sowing in sandy loam to clay loam soils. Drill 35 kg of urea, 50 kg of superphosphate and 10 kg Muriate of Potash/acre at sowing in loamy sand to sand soils. Termite is a serious pest in light textured soil, particularly in Barani areas. Before sowing, treat wheat seed with Cruiser 70 WS @ 1g/kg or Dursban/Ruben/Durmet 20 EC (chlorpyriphos) @ 4 ml/kg seed to check the termite damage at early stage. Seed treated with Neonix also controls smuts of wheat.

**Loose smut and Flag smut:** Treat the seed of wheat with Raxil Easy/Orius @ 0.33 ml/kg seed (Dissolve 13 ml Raxil Easy in 400 ml water and mix with 40 kg seed) or Vitavax @ 2 g/kg or Vitavax Power @ 3g/kg or Tebuseed/Exzole/Seedex 2 DS @ 1g/kg for the management of loose smut and flag smut. Seed treatment should be done with seed treating drum. Seed treatment should not be done earlier than one month of sowing as it affects seed germination.

**PULSES**

**Gram**

1. Grow variety PDG 4 under rainfed conditions from October 10 to 25. In irrigated conditions in the entire state except humid areas, grow varieties PBG 8, GPF-2 and LL 552 and variety PBG 5 which have resistance to gram blight in the sub-mountainous districts and PBG 7 in all the districts under irrigated conditions.

2. The best time of sowing of Desi and Kabuli gram in the entire state is October 25 to November 10 under irrigated conditions.

3. To manage gram blight, grow PBG 7 or PBG 5 in disease prone areas.

4. At the time of sowing, drill 13 kg of urea and 50 kg of single superphosphate per acre for desi gram but in case of Kabuli gram, drill 13 kg of urea and 100 kg of single superphosphate/acre. Also, inoculate the seed with biofertilizer consortium before sowing.

**Lentil**

1. The crop of lentil may be sown in the second fortnight of October in the sub-mountain areas and from the end of October to the first week of November in other areas. Sow variety LL 1373 by using 18 kg per acre of seed and use 12-15 kg per acre of seed for varieties LL 931 and LL 699. Inoculate the seed with Rhizobium culture which ensures higher yield. Drill 11 kg of urea and 50 kg of single superphosphate/acre in case of inoculated seed, otherwise double the dose of single superphosphate at the
time of sowing.

**OILSEEDS**

1. For *raya*, use varieties Giriraj, RLC 3, PBR 357, under irrigated conditions in whole state and PBR 97 under rainfed conditions. RCH 1, PHR 126 and PBR 91 are recommended for South-Western districts only and variety RLM 619 can be sown in irrigated as well as rainfed conditions in Punjab state. The optimum period for sowing of *raya* is second fortnight of October. *Gobhi sarson* varieties GSC 7, GSC 6, GSL 1, GSL 2; and hybrids PGSH 1707 and Hyola PAC 401 should be sown from October 10 to the end of October. Sowing of African *sarson* PC 6 can be started from mid-October to mid-November.

2. Drill 45 kg of urea, 75 kg of single superphosphate and 10 kg Muriate of Potash per acre before sowing. Apply 55 kg of urea and 75 kg of single superphosphate per acre for radish, turnip and carrot. Carrot also requires 50 kg Muriate of Potash per acre. Complete sowing of varieties of Punjab Safed Mooli 2, Punjab Pasand of radish, L 1 of turnip, and PC 161, Punjab Jamuni, Punjab Roshni and Punjab Black Beauty of carrot. Use 2-3 kg seed/acre for turnip and 4-5 kg seed per acre for carrot and radish. Sowing on 45 cm ridges is better for obtaining higher yield, easy harvesting, better root shape, less forking and richness in nutrients. Plant thinning is recommended 15 days after sowing to maintain plant-plant distance for better root development. For large scale planting of carrot, tractor operated inclined plate planter can be used to sow seeds on beds at 67.5 cm spacing. The machine plants 4 rows on each bed with 10 cm spacing between rows and 8 cm between plants and there is no need of thinning.

**FODDER PRODUCTION**

1. *Berseem* and shaftal sowing should be completed in first week of October. This month is also ideal for sowing lucerne, oats and *senji*. *Berseem* crop may be supplied six tonnes farm yard manure (FYM) and 125 kg of single superphosphate per acre before sowing and where FYM is not added, 185 kg of single superphosphate should be applied along with 22 kg of urea per acre.

2. To get higher yield from first cutting, sow *berseem* or lucerne in mixture with oats and *sarson*. This mixture also helps in keeping the *itisit* under check.

3. Conserve surplus maize/sorghum as silage to meet the fodder requirements in lean period for cheaper milk production.

** VEGETABLE CROPS **

**Root crops**
Mix 15 tonnes of well rotten FYM in soil 10 days before sowing. Apply 55 kg of urea and 75 kg of single superphosphate per acre for radish, turnip and carrot. Carrot also requires 50 kg Muriate of Potash per acre. Complete sowing of varieties of Punjab Safed Mooli 2, Punjab Pasand of radish, L 1 of turnip, and PC 161, Punjab Jamuni, Punjab Roshni and Punjab Black Beauty of carrot. Use 2-3 kg seed/acre for turnip and 4-5 kg seed per acre for carrot and radish. Sowing on 45 cm ridges is better for obtaining higher yield, easy harvesting, better root shape, less forking and richness in nutrients. Plant thinning is recommended 15 days after sowing to maintain plant-plant distance for better root development. For large scale planting of carrots, tractor operated inclined plate planter can be used to sow seeds on beds at 67.5 cm spacing. The machine plants 4 rows on each bed with 10 cm spacing between rows and 8 cm between plants and there is no need of thinning.

**Cole crops**
Start transplanting of 4-6 weeks old seedlings of cabbage, mid-season cauliflower, Chinese cabbage and broccoli. Keep line and plant to plant spacing at 30 × 30 cm for Chinese cabbage, 45 × 30 cm for cauliflower, 60 × 45 cm for cabbage and 45 × 45 cm for broccoli. Apply irrigation once a week as per soil and climatic conditions. Do gap filling for good crop stand.

**Pea**
Start sowing of early season pea varieties i.e. Matar Ageta 7 and AP 3. Seed rate is 45 kg/acre for early crop. Start sowing main season pea for green pods from mid-October to mid-November. Sow varieties Punjab 89 and Mithi Phali. Use 30 kg seed per acre. Drill seeds with ridger at 15 cm spacing.

**Potato**
1. Complete sowing of autumn potato crop in the first fortnight of October, particularly for seed production purpose. Use healthy seed tubers.

2. Sow potato after applying 20 tonnes of farm yard manure, 80 kg of urea, 155 kg of single superphosphate, and 40 kg Muriate of Potash per acre. Farm yard manure should be applied about 10 days before planting potato, whereas fertilizer should be applied at the time of sowing preferably mixed with soil to avoid injury to tubers. Higher doses of nutrients can be applied if soil test shows low to very low status of these nutrients.

3. Application of paddy straw mulch at 24 q/acre immediately after planting provides effective weed control. For chemical weed control, spray Gramoxone/Kabuto 24SL (Paraquat) @ 500-750 ml/acre up to 5-10 % emergence of potato crop and complete germination of weeds.

4. For the control of late blight, select healthy tubers for sowing. Infected/rejected tubers taken out of cold stores should be buried instead of keeping such tubers in the open area. Follow high ridge method to avoid tuber infection.

5. Disinfect the seed tubers in 0.080 Systiva or 0.083% Estemo Prime 240 FS or 0.25 % Monceren by dipping for 10 minutes to control black scurf. Avoid sowing of potato in fields with high incidence of common scab. Keep the soil wet at tuberization to minimize the scab infection. If there is a heavy shower in 3rd /4th week of October, protect the crop immediately by spraying Indofil M-45/Mass M-45/Markzeb/Kavach/Antracol @ 500-700 g/acre.

**Onion**
1. Sow 4-5 kg seed on raised beds on an area of 8 marlas for raising nursery for one acre. For red onions, sow POH 1 hybrid/PRO 7/PRO 6/Pb Naroya varieties; for white onions sow PWO 1/Pb White and for yellow onions sow PYO 2.

2. Irrigate *kharif* planted crop as per soil and prevailing climate conditions.

3. Plant 8-10 quintal graded mother bulbs at 60 x45 cm for raising seed crop on one acre in the first fortnight of November.

**Tomato**
Start sowing nursery of tomato. Use 100 g seed of the recommended varieties/hybrids
in two marlas (50 m$^2$) bed area to grow seedlings for an acre. Sowing of Punjab Ratta, Punjab Red Cherry, Punjab Kaser Cherry, Punjab Sonna Cherry, Punjab Sartaj, Punjab Gaurav, Punjab Sawarna, Punjab Chhuvara varieties and PTH 2 hybrid can be done. Grow nematode resistant variety PTH 2 and Punjab NR 7 in infested fields. In root-knot nematode infested poly/nethouse, apply Velum Prime @ 500 ml/acre at the time of transplanting of tomato (dissolve 1 ml Velum Prime in 10 litres of water and drench the soil with 1 litre solution of Velum Prime per sq m).

**Leafy Vegetables**

Sow Palak variety Punjab Green using 5 kg seed per acre at spacing of 20 cm between rows. Apply 10 tonnes of FYM, 35 kg of urea, and 75 kg of single superphosphate per acre before sowing. Sow Kasuri methi variety Punjab Supreme using 10 kg seed per acre. Sow by pora method in rows 20 cm apart. Apply 65 kg of urea in three split doses, half at sowing and remaining two in equal split after first and second harvesting of leaves.

**HORTICULTURAL OPERATIONS**

1. Intercropping of Rabi season crops like wheat, peas, senji and black gram can be done in young and non-bearing orchards. Make sure that the irrigation system for intercrop and fruit plants are separate.

2. The newly planted fruit plants should be staked with bamboo sticks in order to build the string framework and proper shape. The suckers arising from the root-stock portion should be removed regularly.

3. To suppress weeds, the non-bearing orchards should be cultivated lightly for the control of perennial weeds like haru, bhang, kahi, motha, parthenium, etc. The basins of trees can be cleaned manually with kharpa or spade. For weed management in ber orchards, apply paddy straw mulch @ 5.0 tonne/acre under the tree canopies during second fortnight of October.

4. In ber, physiological fruit drop can be managed with spray of 15 g NAA (Naphthalene Acetic Acid) in 500 litres of water during second fortnight of October and again in second fortnight of November. Dissolve NAA in small quantity of alcohol before mixing in water.

4. In loquat, it is a proper time for the application of first split of recommended dose of N (500 g urea/plant).

5. Spray 200 ml Crocodile/Confidor 17.8 SL in 500 litres of water per to manage citrus leaf minor and citrus psylla if prevalent in orchards.

6. For management of citrus canker, spray 50 g of streptocycline + 25 g of copper sulphate in 500 litres of water per acre during this month, and repeat during December and February. Bordeaux mixture (2:2:250) or copper oxychloride (0.3%) can also be sprayed.

7. To manage leaf mould and leaf spots in ber, spray Bordeaux mixture (2:2:250) in this month.

8. For the control of Mango Malformation, remove the affected shoots every month and destroy them. Spray Naphthalene Acetic Acid (NAA) in October. Dissolve 100 g NAA in 100-150 ml alcohol and make the volume 500 litres.

9. Transplanting of strawberry can be done in this month.

10. The harvesting of an early maturing sweet oranges such as Mosumbi and Early Gold can be started in this month.

11. The autumn bloom of Dahlia from terminal discharge, bellowing, etc. Animals must conceive within 60-90 days after calving.

12. Animals seen in heat in morning are to be inseminated in evening and vice versa. Double insemination can be done in cows if their heat is prolonged.

13. Provide clean, dry and good bedding, especially for young calves. Colostrum must be fed to the calves within 30 minutes after their birth. Get the calves disbudded and dewormed within 10 days and 15 days of birth, respectively. Apply antiseptic cream on the wound regularly after disbudding.

14. Regular grooming of calves should be done to keep them clean. This practice will also help in detecting wound or tick infection.

**DAIRY AND ANIMAL HEALTH**

1. Watch the animals regularly in the morning and evening for heat symptoms like mucous discharge, bellowing, etc. Animals must conceive within 60-90 days after calving.

2. Animals seen in heat in morning are to be inseminated in evening and vice versa. Double insemination can be done in cows if their heat is prolonged.

3. Provide clean, dry and good bedding, especially for young calves. Colostrum must be fed to the calves within 30 minutes after their birth. Get the calves disbudded and dewormed within 10 days and 15 days of birth, respectively. Apply antiseptic cream on the wound regularly after disbudding.

4. Regular grooming of calves should be done to keep them clean. This practice will also help in detecting wound or tick infection.
5. The crossbred animals are more susceptible to various diseases associated with change in climatic conditions. These animals and their calves are likely to get diarrhea may be due to internal parasites. Seek veterinary advice immediately, and get the calves dewormed and diarrhea treated.

6. Prepare fields for sowing of berseem and rye grass to be used as winter fodder.

7. Regularly feed the mineral mixture to the animal, and give fresh water and provide green fodder and concentrate mixture.

8. The adult animals should be dewormed with broad spectrum anthelmintic after three months of interval. The anthelmintic used earlier should be changed in consultation with local Veterinarian to avoid anthelmintic resistance.

9. Prophylactic measures for control of tick, flies and mites should be taken.

10. To prevent animals from Lumpy Skin Disease, avoid animal’s exposure to sick animals or visitors; control ticks, mosquitos and flies by making smoke made by burning of guggal, camphor and neem leaves over cow dung cake during morning and evening. Apply alum solution with clean cloth on the skin of affected animals. Healthy animals should be vaccinated with Goat Pox vaccine.

POULTRY

1. Provide 14-16 hours lights including daylight to your flock if the flock has come in production.

2. Provide extra grit in addition to marble powder in feed for better quality of egg shell.

3. Keep the litter dry by stirring it 2-3 times in a week. If there is any wet part of litter, remove it immediately. Keep the litter depth 4-5 inches.

4. It is good time for raising broiler chicks. Get your chicks from reputed hatchery. Provide broiler chick feed for the first four weeks and then broiler finishes ration for 2-3 weeks to attain proper weight.

5. Always use good quality balanced feed free from dust and molds to avoid infections and drop in egg production.

AGROFORESTRY

Poplar

Irrigate poplar plantations and nurseries at fortnightly interval. Prune the branches of the nursery for ensuring better quality planting stock. In case there is incidence of bark eating caterpillar, collect and destroy the infested leaves. Sowing of sugarcane/mustard as intercrop can be done.

MUSHROOM CULTIVATION

1. Clean and disinfect the growing rooms with 4-5 % formalin solution at least one week before the compost formation for button mushroom (1st – 2nd week of October).

2. The ready compost (dark brown in color) is spawned in the 2nd-3rd week of October in the cross ventilated covered space.

3. After spawning, the compost is filled in polythene bags, wooden trays and shelves for its cultivation which are either covered with newspaper or polythene sheets. To keep the top surface of the trays/shelves moist, water is sprinkled on these sheets regularly once a day. In polythene bags, no watering is required during spawn run period of button mushroom.

4. No cross ventilation is required during spawn run period of button mushroom (first two weeks after spawning).

5. Disinfect farm yard manure and sandy soil (4:1) with 4-5 % formalin solution for its use as casing soil after spawn run.

6. Cultivation of dhingri can also be started during this month.

7. Procure fresh paddy straw and store it at a dry place for its further use for paddy straw mushroom cultivation during summer.

BEE KEEPING

Measures should be undertaken to strengthen honey bee colonies to exploit honey flow from ber, and for ensuing flow from toria crop in Punjab and from sarson in Rajasthan. If feasible, the colonies may be migrated to areas where these crops are grown in abundance, for increasing honey production and colonies’ growth. However, safe distance among the migratory apiaries of different beekeepers must be maintained to prevent the spread of bee diseases and mites. Dust sulphur powder on the top bars of bee combs underneath inner cover @ 1.0 g per comb against brood mite (Tropilaelaps clareae). Alternatively, fumigation with formic acid (85%) @ 5 ml daily for two weeks may be applied. The latter treatment will also take care of Varroa mite. However, formic acid should be avoided during nectar flow. In the case of heavy infestation by Varroa mite, destruction of capped drone brood comb part, Varroa trapping on drone brood and then its destruction, and the use of sticky papers on bottom board can also be integrated. Dusting of icing sugar @ 15g per 10 bee-frame strength colony in the evening in between the bee combs is also helpful in reducing the mite population. Spray of freshly prepared oxalic acid solution (4.2% in 60% sugar solution) @ 5 ml per comb of bees in late evening thrice at weekly interval is also helpful against Varroa mite. Proper spacing among the colonies and the extraction of honey from only the brood free supers separated from brood chamber with horizontal queen excluder help in preventing spread of Varroa among the colonies in apiary. Keep vigil on the brood diseases and on suspicion, immediately consult experts and take suggested control measures; non-chemical methods should be preferred. The suspected colonies should immediately be isolated from the healthy stock. Use of antibiotics against bee diseases should be avoided. In the areas of congenial climate and floral conditions and depending on the colony performance/development including drone bees’ availability, mass queen rearing and colony multiplication or requeening can also be undertaken.

Compiled by: Amarjit Singh
Training Programmes in October

October 03-11: Mushroom cultivation and processing
October 04: Operational skill training for Happy Seeder and Super Seeder
October 09-17: Pig Farming
October 10: Control of insect pests and diseases in peacrop
October 11: Nutrient management in vegetable crops
October 12: New production technologies for rabi crops
October 13: Integrated Disease and Pest Management in rabi crops
October 17: Nutrient management strategies, identification of deficiency symptoms in rabi crops and their remedial measures
October 18: Improved agronomic practices for the cultivation of celery
October 19: Awareness on food safety and techniques to check food adulteration
October 20: Management of repeat breeding in dairy animals
October 23-30: Preparation of bakery and confectionary products

October 03-11: Dairy Farming
October 04: Rice residue management technologies for improving soil health
October 05: Seed plot technique for raising disease-free potato seed
October 09-13: Beekeeping-a lucrative subsidiary occupation
October 11: Integrated Pest and Disease Management in rabi crops
October 12-13: Garment enrichment through different techniques
October 18: Management of repeat breeding in dairy animal
October 19: Climate change and its adverse effects
October 20: Formation of farmer groups/FPOs/CIGs
October 25-31: Protected cultivation of vegetable crops
October 26-27: Nutritious recipes for young children and pregnant/lactating women
October 30: Establishment of nutrition garden in urban and peri-urban area
October 31: Management of rodents

October 3-4: Improved cultivation practices of rabi cereals/oilseeds/pulse crops
October 04: Seed treatment-a preventive measure for seed borne diseases
October 05: Establishment of nutrition garden in urban and peri-urban areas including soil less model
October 06: Diagnosis and management of nutrient deficiencies in kharif crops
October 09-13: Bakery and Confectionary
October 10: Integrated Nutrient Management in rabi crops
October 11: Integrated Weed Management in rabi crops
October 12: Nutritious recipes for young children and pregnant/lactating women
October 16-20: Beekeeping-a lucrative subsidiary occupation
October 17: Management of repeat breeding in dairy animals
October 18: Small scale agro-industry-a way to become an entrepreneur
October 19: Preparation of sweets at home in festive season
October 20: Happy seeder technology for crop residue management

October 03-09: Quality production of guj/shakar
October 04-10: Special cookery
October 05-11: Pig Farming
October 06-12: Special cookery
October 09-13: Beekeeping and processing and marketing of honey
October 10: Improved cultivation practices of rabi crops
October 11: Management of repeat breeding in dairy animals
October 12: Techniques to check food adulteration
October 13: Management of paddy residue by using different farm machinery
October 16-20: Quality production of guj/shakar
October 17: Cultivation of winter season vegetables
October 20: Special cookery
October 23: Establishment of nutrition garden in urban and peri-urban areas

October 03: Green fodder production round the year
October 04: Seed plot technique for raising disease-free potato seed
October 05: Soilless model for vegetable kitchen garden
October 06: Processing of eggs and milk at domestic level
October 09-13: Entrepreneurship development based on small scale farming
October 10: Insect-pest and disease management in rabi crops
October 11: Diagnosis and management of nutrient deficiencies in rabi crops
October 16-20: Technique of baking for milllets
October 23: Silage making for dairy animals during lean period
October 25-31: Beekeeping - a lucrative subsidiary occupation
October 26: Improved cultivation techniques of rabi crops
October 27: Seed treatment-a preventive measure for seed borne diseases
October 31: Integrated Weed Management in rabi crops

October 03-11: Beekeeping-a lucrative subsidiary occupation
October 04: Preventive/post-accident guidelines in agricultural operations
October 05: Seed treatment - a preventive measure for seed-borne diseases
October 06: Production technologies of root and leafy vegetable crops
October 09-13: Protected cultivation of vegetable crops
October 10: Farm machinery for crop residue management
October 11: Improved cultivation techniques of rabi crops
October 12: Improved cultivation practices of rabi cereals/oilseeds/pulse crops
October 03: Integrated Farming System
October 04: Improved cultivation practices of *rabi* crops
October 05: Integrated Pest Management in *rabi* crops
October 06: Improved cultivation practices of *rabi* crops
October 09-13: Efficient use of agricultural machinery and its repair and maintenance
October 16-20: Beekeeping—a lucrative subsidiary occupation
October 18: Integrated Nutrient Management in *rabi* crops
October 25: Safe use and handling of spraying equipments and farm machinery
October 26: Efficient use of crop residue management machinery
October 31: Diagnosis of nutrient deficiencies in *rabi* crops and their remedial measures

... KVK, LUDHIANA (SAMRALA) (01628-261597) ...

October 03: Efficient utilization of non-conventional energy gadgets
October 06: Efficient use of crop residue machinery
October 09-17: Protected cultivation of vegetable crops
October 10-20: Dairy Farming
October 12: Raising of winter season annual flowers
October 19: Seed treatment—a preventive measure for management of seed-borne diseases
October 20: Care and management of newly born calves and pet animals
October 26: Custom hiring of agricultural machinery
October 27: Food safety and techniques to check food adulteration
October 28: Integrated Pest and Disease Management in *rabi* crops

... KVK, MOGA (BUDDH SINGH WALA) (81465-90942) ...

October 03: Efficient use of crop residue machinery
October 04: Cultivation of potato and onion
October 06: Efficient use of crop residue machinery
October 09: Improved plant protection practices in *rabi* crops
October 10: Organic farming in vegetables
October 11: Balanced diet for different age groups
October 12: Food safety and techniques to check food adulteration
October 13: Diagnosis and management of nutrient deficiencies in *rabi* crops
October 16-20: Seed production techniques in *rabi* crops
October 17: Integrated Farming System
October 18: Improved cultivation techniques of winter season fruits and vegetable crops
October 19: Processing and packaging of millets
October 20: Effect of weather parameters on vegetable production
October 23: Management of repeat breeding in dairy animals
October 25: Improved cultivation techniques of *rabi* crops
October 26: Diagnosis and management of nutrient deficiencies in *rabi* crops

... KVK, PATHANKOT (98762-95717) ...

October 03: Effective use of Information and Communication technologies in agriculture
October 04-10: Preparation of bakery and confectionary products
October 05: Seed treatment and Integrated Pest Management of *rabi* crops
October 06: Small scale agricultural processing technologies especially for millets
October 09-13: Agro Processing Complex (APC) use and maintenance
October 10: Improved cultivation practices for *rabi* crops
October 11: Paddy straw management
October 12: Management of repeat breeding problem in dairy animals
October 13: Integrated Pest Management strategies for sugarcane
October 16-20: Value addition of millets
October 17: Improved cultivation techniques and Integrated Nutrient Management in *rabi* crops
October 24: Integrated Nutrient Management in *rabi* crops
October 25-31: Protected cultivation of vegetable crops

... KVK, PATIALA (RAUNI) (94642-10460) ...

October 05: Seed plot techniques for raising disease free potato seed

October 06: Scientific cultivation of *rabi* crops
October 09: Management of paddy straw by using different crop residue machinery and its custom hiring
October 10: Improved crop protection practices in *rabi* crops
October 11-17: Versatile usage of phulkari craft
October 12: Soil less model for vegetable kitchen gardening
October 19: Importance of seed treatment and management of seed borne diseases and insect-pests of *rabi* crops
October 25-31: Entrepreneurship development in bakery and confectionery
October 26: Management of anoestrus and repeat breeding in dairy animals

... KVK, ROPAR (01881-220460) ...

October 04: Improved techniques for berseem seed production
October 06: Care and management of woolen clothes
October 09-13: Raising nursery of vegetable crops
October 10: Planning and planting of nutrition garden
October 12: Seed plot technique for raising disease free potato seed
October 13: Integrated Pest and Disease Management in *rabi* crops
October 16: Integrated Nutrient Management in *rabi* crops
October 17: Improved cultivation techniques of *rabi* crops
October 18: Seed treatment—a preventive measure for seed-borne diseases
October 19: Improved cultivation practices for *rabi* crops
October 20: Diagnosis and management of nutrient deficiencies in *rabi* crops
October 25: Establishment of vegetable and fruit nutrition garden
October 27: Weight estimation for marketing of agroforestry trees

... KVK, SANGRUR (KHERI) (01672-245320) ...

October 03: Wheat sowing with happy seeder/ super seeder/ PAU smart seeder for paddy residue management
October 04: Raising of winter season annual flowers
October 05: Seed treatment of *rabi* crops and proper spraying techniques
October 06: Amelioration of nutrient deficiency in wheat and berseem
October 09-13: Beekeeping, honey processing and marketing
October 10: Integrated Pest and Disease Management in *rabi* crops
October 12: Machinery for paddy straw management
October 13: Diagnosis and management of nutrient deficiencies in *rabi* crops
October 18: Integrated Pest Management in *rabi* crops

... KVK, SHAHEED BHAGAT SINGH NAGAR ...

October 03: Efficient use and management of crop residue machinery
October 04: Raising of winter season annual flower
October 05: Preparation of value added products from milk
October 09-13: Preparation of healthy sweets for festive season
October 10: Integrated Pest and Disease Management in *rabi* crops
October 11: Protected cultivation and nursery raising technique of vegetable
October 12: Importance of mineral mixture blocks
October 13: Custom hiring of agricultural machinery
October 16-20: Protected cultivation of vegetable crops
October 25: Diagnosis and management of nutrient deficiencies in *rabi* crops
October 26: Balanced diet for different age groups

... KVK, SRI MUKTSAR SAHIB (GONEANA) (94630-226052) ...

October 03: Efficient use and management of crop residue machinery
October 04: Raising of winter season annual flower
October 05: Seed treatment and integrated pest management of *rabi* crops
October 06: Small scale agricultural processing technologies especially for millets
October 09-13: Agro Processing Complex (APC) use and maintenance
October 10: Improved cultivation practices for *rabi* crops
October 11: Paddy straw management
October 12: Management of repeat breeding problem in dairy animals
October 13: Integrated Pest Management strategies for sugarcane
October 16-20: Value addition of millets
October 17: Improved cultivation techniques and integrated nutrient management in *rabi* crops
October 24: Integrated Nutrient Management in *rabi* crops
October 25-31: Protected cultivation of vegetable crops

... KVK, PATIALA (RAUNI) (94642-10460) ...

October 05: Seed plot techniques for raising disease free potato seed

Compiled by: Dr Inderpreet Kaur Boparai and Dr Manoj Sharma
Hunjan Hospital (Ludhiana) - A World Class and International Branded Hospital for Mako-Robotic Arm Assisted Surgeries in Joint Replacement

Hunjan Hospital has introduced a new and world-wide adopted, US FDA approved MAKO-ROBOTIC Arm assisted surgery enables surgeon to deliver with precision, making health care better with increased accuracy. Dr. BS Hunjan and Dr Jaiveer Hunjan have earned a reputation not only within the country but across the world. According to Dr BS Hunjan MBBS, MS, MCh (Ortho) Director and world-renowned joint replacement surgeon said “that MAKO ROBOTIC ARM assisted surgery allows surgeon to make precise bone cuts on the joint and it has tremendous patient benefits such as precise planning and bone cuts, more bone and soft tissue preservation, less post up pain, faster recovery, quicker discharge from hospital, less blood loss and to top it all surgery is not expensive.

According to Dr. Jaiveer Singh Hunjan (MBBS, MS Ortho) "with the new world class MAKO ROBOTIC ARM Assisted tech, it eliminates possibilities of human error and ensures perfect alignment, leading to longevity of the knee and joint implant and enables the patient to return to active lifestyle earlier" Dr Jaiveer Hunjan has the Honor of becoming First Youngest MAKO ROBOTIC ARM Assisted Surgeon in the World.

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